MACHINERY

Design—Construction—Operation

Volume 46 DECEMBER, 1939 Number 4

PRINCIPAL ARTICLES IN THIS NUMBER

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DEPARTMENTS

Around the World with American Machine Tools **will be the theme of the leading article in January MACHINERY, which will be followed by other articles showing American machine tools in actual use in Great Britain, France, Russia, Japan, and a great many other countries. One article will deal with selling machine tools in South America—a timely subject. Articles on the manufacture of small-arms ammunition, the use of cast versus welded construction for press frames, and the regular departments published each month will be included.**

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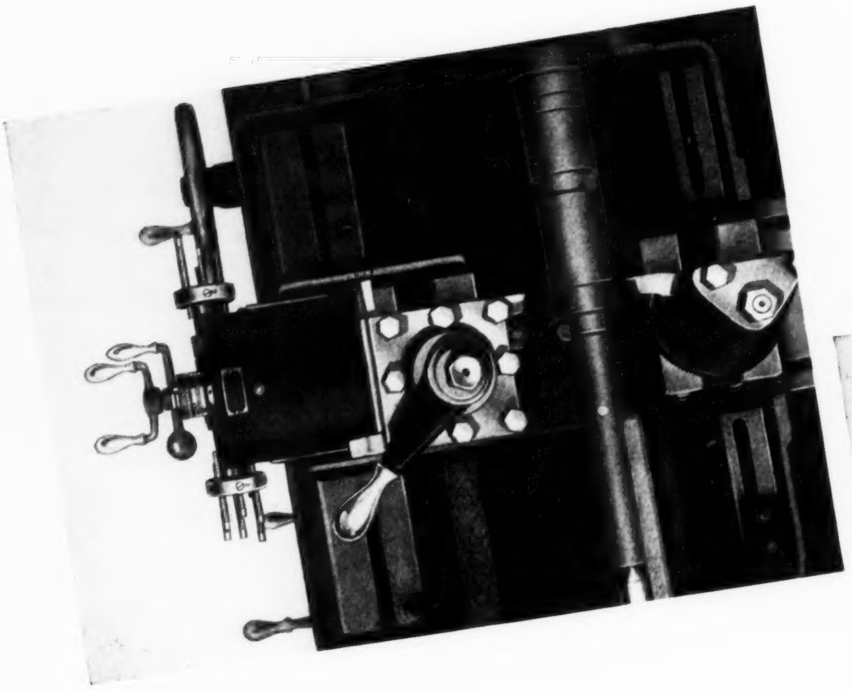

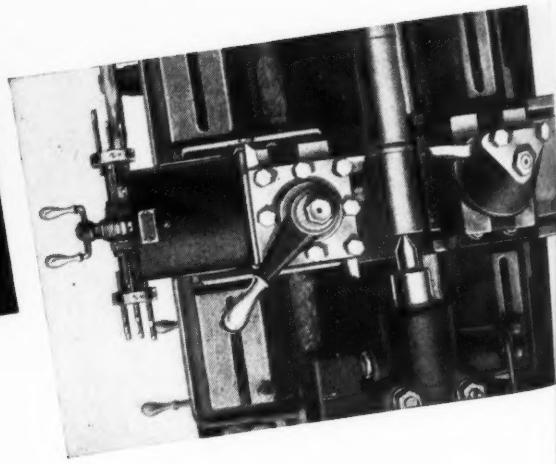

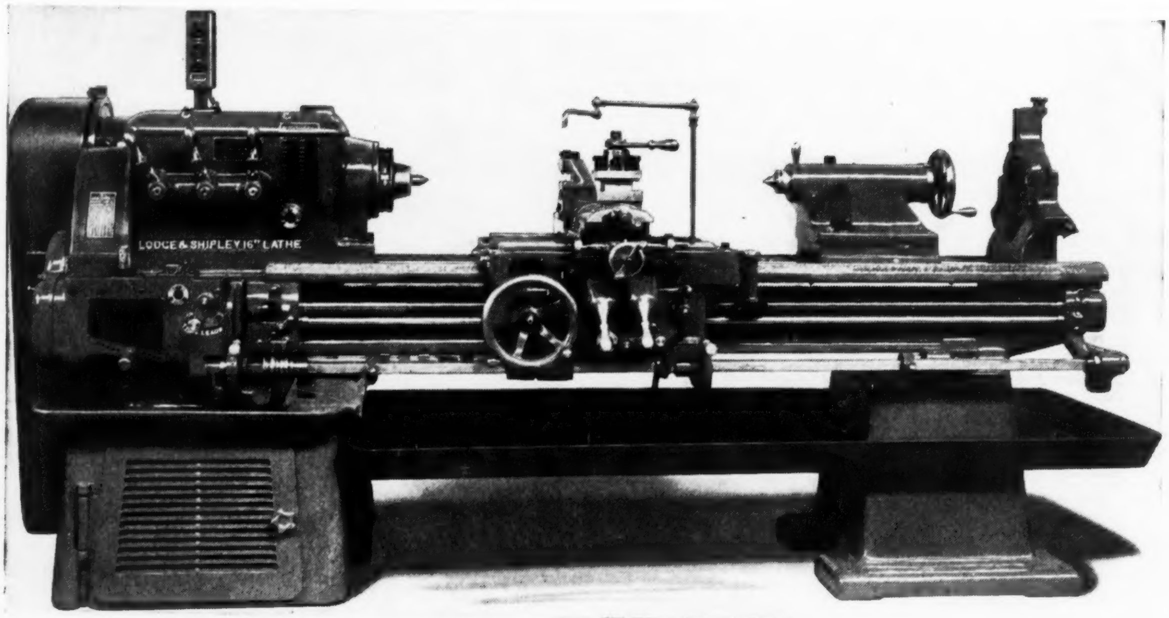

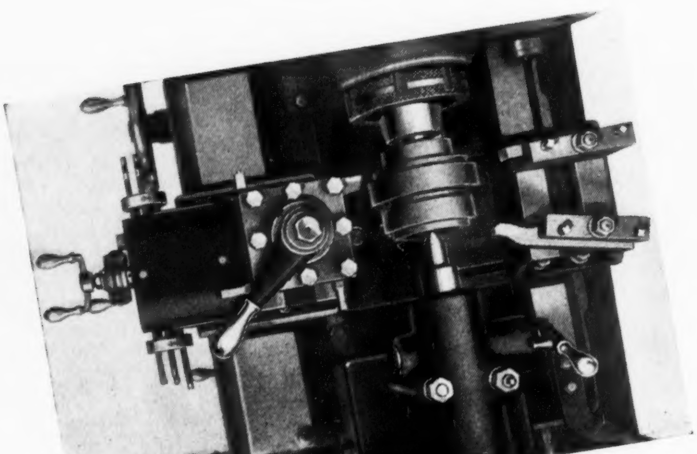

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Volume 46 NEW YORK, DECEMBER, 1939 Number 4

Modern Shop Equipment Builds Our Mechanized Ordnance

Adequate National Preparedness Requires Arsenals Well Equipped with Metal-Working Machinery Comparable to that Used in the Most Progressive Industrial Plants

By COLONEL NORMAN S. RAMSEY
Commanding Officer, Rock Island Arsenal
Rock Island, Ill.

THE vital importance of mechanized ordnance to the armies of today has been made apparent by the warfare now being waged on European battlefields. Fast traveling tanks, anti-aircraft guns, and other mobile equipment have been found absolutely essential in both offensive and defensive military tactics.

Mobile equipment for the United States Army is produced at Rock Island Arsenal, which has been supplied during recent years with a large number of the most up-to-date types of machine tools and other metal-working machines. Many

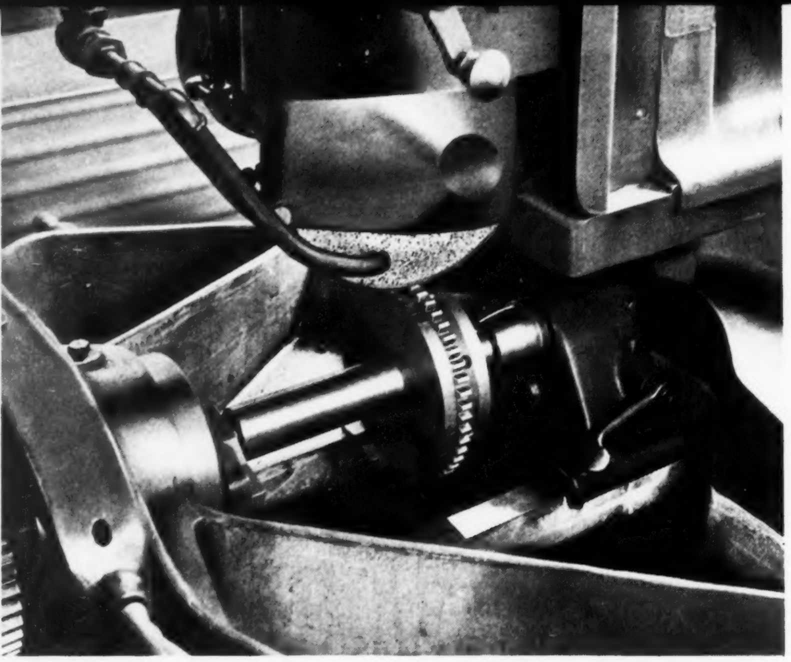


Fig. 1. Tank Transmission and Speedometer Gears are Ground to a Tolerance of 0.0005 Inch with Respect to Tooth Form and Dimensions

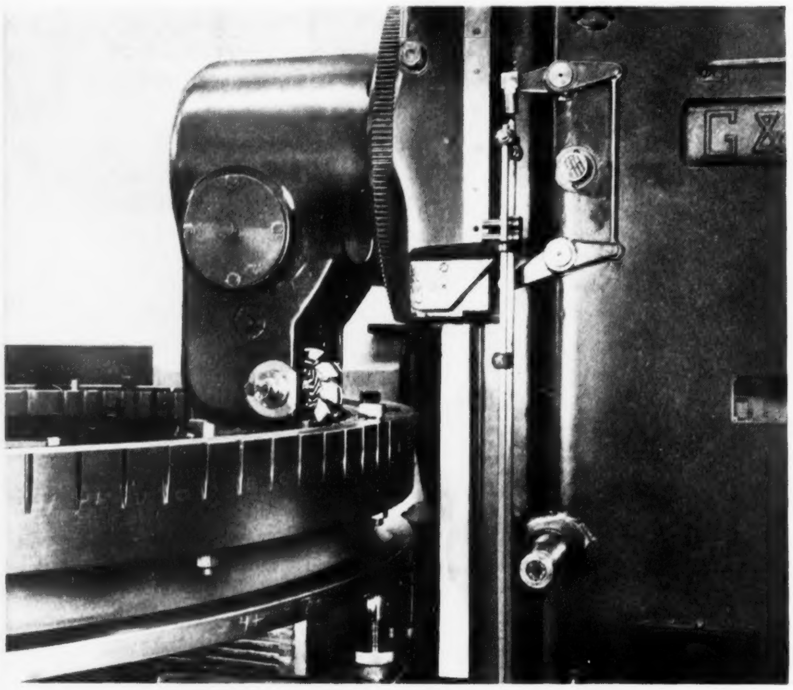
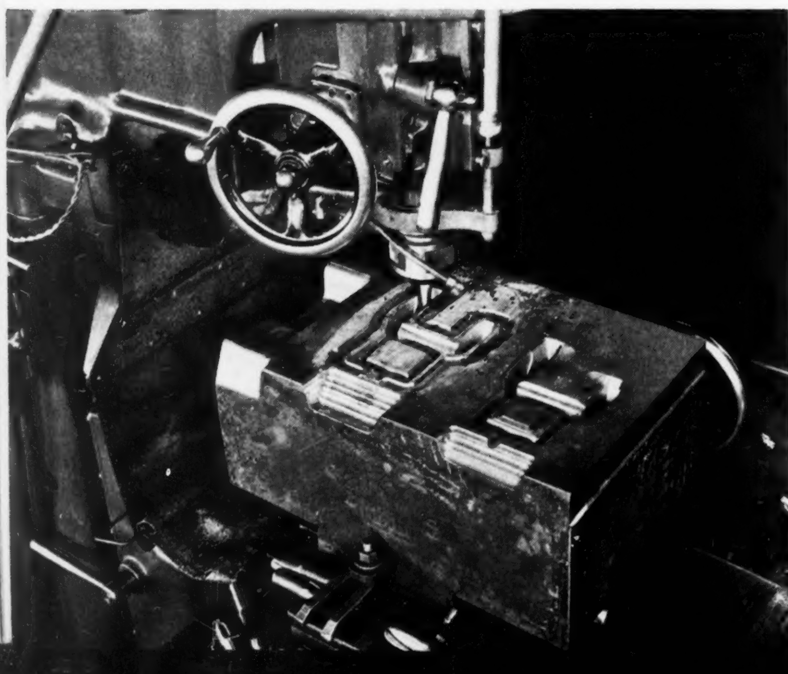


Fig. 2. Special Cutter-head Provided on a Machine Used for Cutting the Teeth of Internal Gears up to 92 Inches Pitch Diameter



of the manufacturing operations performed in this arsenal were described in an article published in July MACHINERY. The present article will deal with additional operations in the gear-cutting and automatic departments, the tool-room, and the sheet-metal shop.

All transmission gears for tanks, as well as speedometer gears, are finished, after hardening, on the Pratt & Whitney gear-tooth grinder shown in Fig. 1. A tolerance of 0.0005 inch is specified with respect to tooth form, pitch diameter, and chordal thickness. Gears up to 10 inches in diameter and as small as 1 1/4 inches, with either spur or helical teeth, are ground. The example shown has a pitch diameter of 8 1/2 inches.

Internal gears up to 92 inches in diameter are cut on a Gould & Eberhardt machine equipped with a special tool-head, as illustrated in Fig. 2. The cutter-spindle is driven through helical gears on each side of the cutter, to which power is transmitted from the main drive of the machine. In a typical job the tooth spacing between any two teeth must not vary more than 0.004 inch. The gear blank is mounted in a circular fixture which is provided with vertical grooves accurately milled around the periphery for indexing purposes. In indexing, a pin on a slide attached to the rear side of the machine column is entered into one of these grooves and a reading taken on the pin by means of a dial gage to determine the accuracy of the setting.

Machines of the latest types have also been installed in the tool-room. One of these machines, a Pratt & Whitney universal die-sinker with an oscillating cutter-head, is shown in Fig. 3 cutting impressions in a typical drop-forge die. The advantage of the oscillating head is that circular surfaces, both concave and convex, can be automatically milled. It is estimated by the tool-room that this type of machine results in a saving in time of from 35 to 40 per cent over old style die-sinkers.

There are three new Pratt & Whitney jig borers, one of which is shown in Fig. 4 equipped with a Precision universal boring head. The operation consists of boring holes in a milling fixture within close limits as to center distance and parallelism. The Rockford hydraulic shaper shown in Fig. 5 is engaged in machining a trimming die for drop-forgings. The irregular contour of this die was finished on a Keller-matic automatic tool-room machine.

The lead, pressure angle, and tooth form of hobs with straight or helical flutes, and corresponding elements of worms, are checked in

Fig. 3. Typical Die-sinking Operation being Performed on One of the Latest Machines in the Tool-room

the Illinois universal hob and worm measuring machine illustrated in Fig. 6. This machine is also used for checking the concentricity of the relieving clearance on hob teeth and the spacing of threads or "starts" on multiple-threaded hobs and worms. Any setting of the dial gage necessary for checking the various elements can be readily obtained. The hob being checked is 5 inches in diameter by 8 inches long.

The final drive-shafts for tanks are turned in the automatic screw machine and turret lathe department in a Monarch lathe tooled up as shown in Fig. 7. Turning cuts are taken on the straight and tapered surfaces by tools on the rear carriage, which also face two shoulders and chamfer the end. A tool on the front slide faces the end. The automatic operation of the tool-slides is governed by the Magna-Matic electrical control board at the rear of the machine. These parts, which are chromium-nickel forgings, are machined in this operation at the rate of forty minutes per piece.

On the front slide of the Cleveland 2 5/8-inch automatic illustrated in Fig. 8 may be seen examples of work turned out by one of the newest machines in the automatic department. This machine is shown tooled up for producing the small spool-like piece *A*, which is made from S A E 2340 steel at the rate of seventy seconds per piece. It is rough- and finish-formed from bar stock by form cutters on the two top slides, and drilled, reamed, and bored by tools on the main slide. A tolerance of 0.001 inch is specified on the hole diameter, and the width between two lands must be maintained within 0.002 inch. A particularly fine finish is required on the surfaces of the annular V-groove.

At *B* are shown domed pieces which are produced from steel bar stock in an average time of fifty-five seconds. The under side of the dome is counterbored in the machine to a thin wall, a tolerance of 0.002 inch being specified for this diameter. These parts are 2 1/2 inches maximum diameter. At *C* is shown a part approximately 1 1/2 inches in outside diameter which is machined out of steel bar stock to a circular and end wall thickness of 1/16 inch. In addition, an annular recess 0.032 inch deep must be cut around the inside surface, and the outside surface must be knurled for a short distance from one end. This piece is produced in twenty-six seconds.

The part shown at *D* is made from phosphor-bronze bar stock, being formed on the outside by tools on the top slides while drilling, tapping, and recessing operations are performed by tools on the main slide. At *E* is another

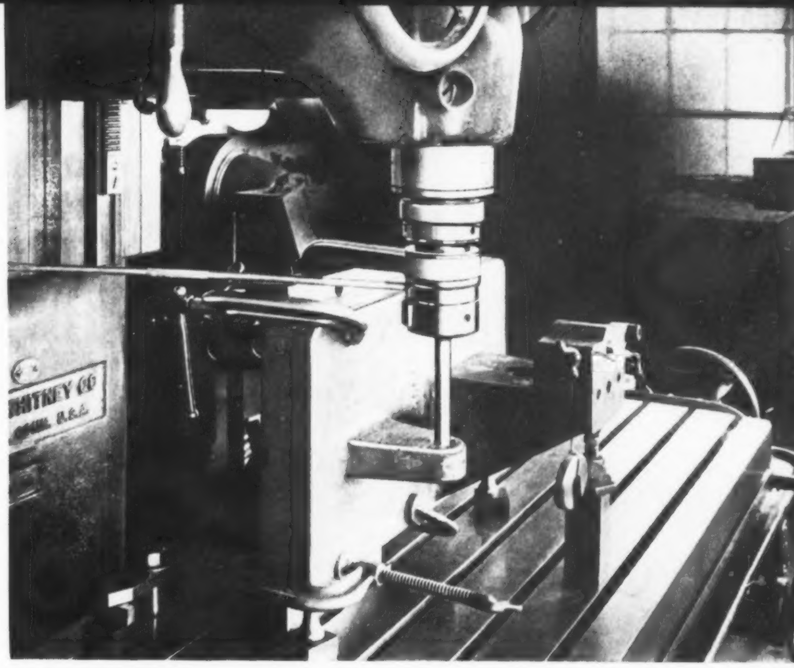


Fig. 4. Jig Borers are Used in the Tool-room for the Accurate Machining of the Jigs and Fixtures

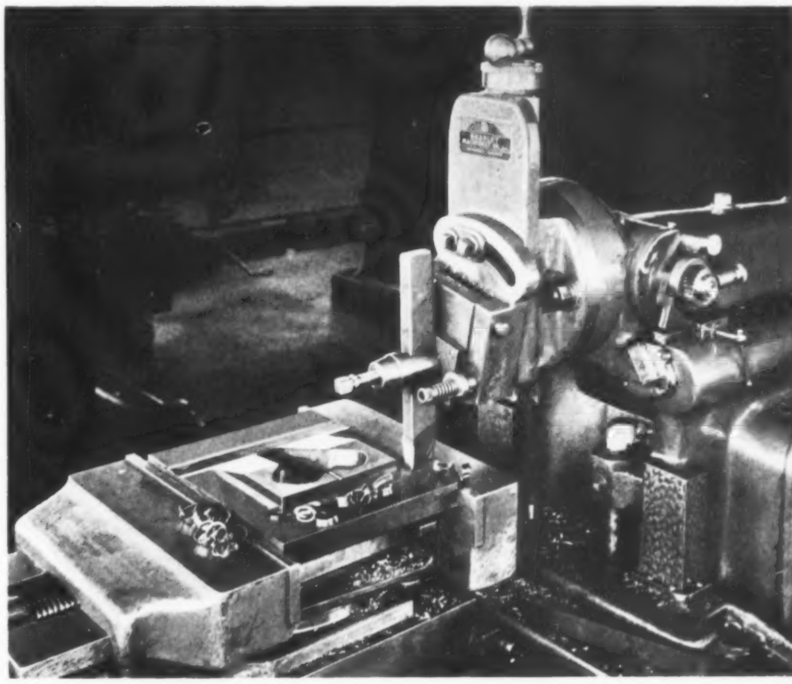


Fig. 5. Hydraulically Actuated Shaper being Used for Machining a Hot Trimming Die for Drop-forgings

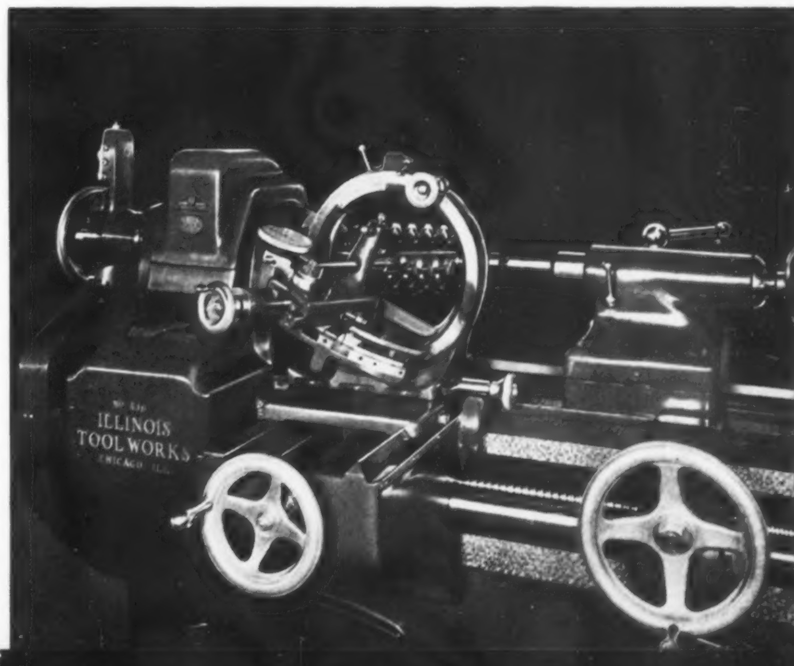


Fig. 6. Universal Hob and Worm Measuring Machine being Used for Checking the Various Elements on a Hob

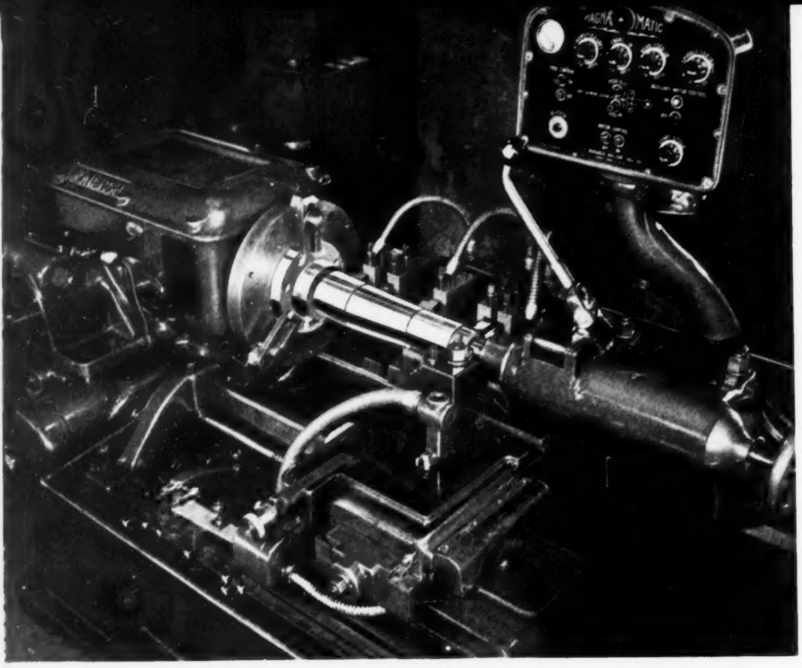


Fig. 7. Multiple Tooling Provided on a Lathe for Machining Tank Final Drive-shafts; the Electric Control Speeds up Production

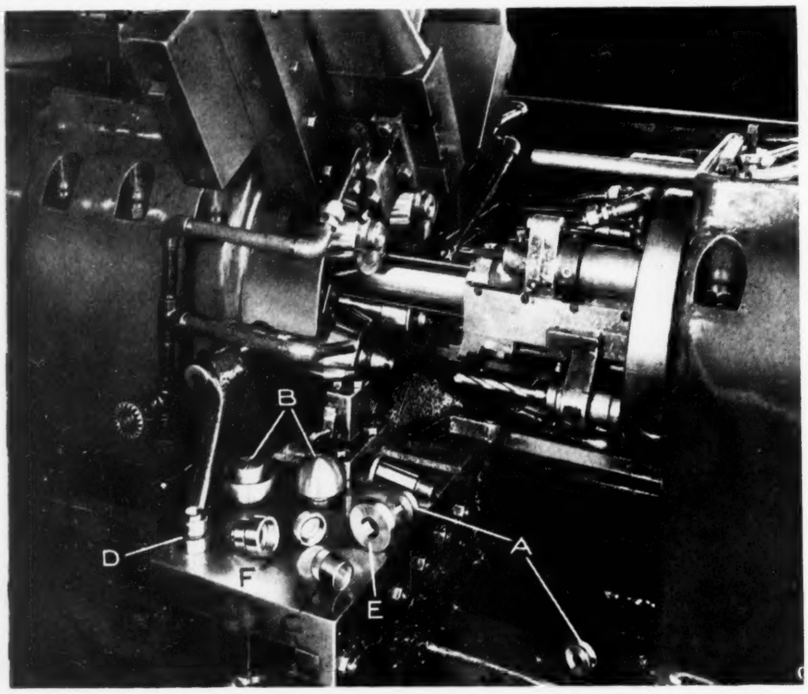


Fig. 8. Four-spindle Automatic Used for Producing a Variety of Work Indicated by the Pieces Seen on the Bottom Front Slide

piece made from phosphor-bronze, which is threaded on the outside, and at *F* a part made from the same material with a knurled surface.

The Warner & Swasey turret lathe shown in Fig. 9 is employed for producing shafts for anti-aircraft guns from hard manganese bar stock. These shafts are 13 3/8 inches long over all, and have a maximum diameter of 1 inch which must be maintained within plus 0.000 minus 0.001 inch as the pieces come from the machine. A 7/8-inch thread, 14 per inch, NF-2, is cut on one end, and a 1/2-inch thread, 20 per inch, NF-3, on the other end. In this operation, the stock is first fed to the turret stop, after which a roller-supported turning tool on the turret turns the overhanging end. The next turret tool centers the end of the bar, and then, while a center on the turret supports this end, the remaining length is turned by a tool on the front toolpost.

A Geometric die-head on the next station of the turret then cuts the thread, after which a button die on the turret is traversed over the thread in case the latter is over size, which sometimes happens because of the material being unusually tough. Two tools on the back toolpost face the shoulders of the large-diameter portion to length just before the piece is cut off. The opposite end of these shafts is machined in the same turret lathe with a slight modification in the tooling.

One of the unusual machines in the sheet-metal department is a large Wiedemann turret type punching machine which has a throat of 54 inches and a punching capacity of 160,000 pounds. A close-up view of the turret-head of this machine is shown in Fig. 10. With ordinary punches, this machine can blank holes up to 4 inches in diameter in 1/4-inch mild steel, and with shear punches, up to 6 inches in diameter. The turret is equipped with twenty-four punches ranging in diameter from 3/8 inch to 6 inches to suit the blanking of holes in platform plates and outriggers for anti-aircraft guns and other parts. Holes of the same size are punched all over the platform plate, but on outriggers the holes vary in size.

Any punch can be quickly indexed by power into the operating position. The turret is located in the various indexed positions by a plunger that enters bushings in the side of the turret. Tables on each side of the turret, fitted with rollers, and a long narrow table that extends across the front of the machine, are operated by power to position the sheets of aluminum or steel in and out or crosswise relative to the punch and die in operation. Scales on the front table and on the bed facilitate approxi-

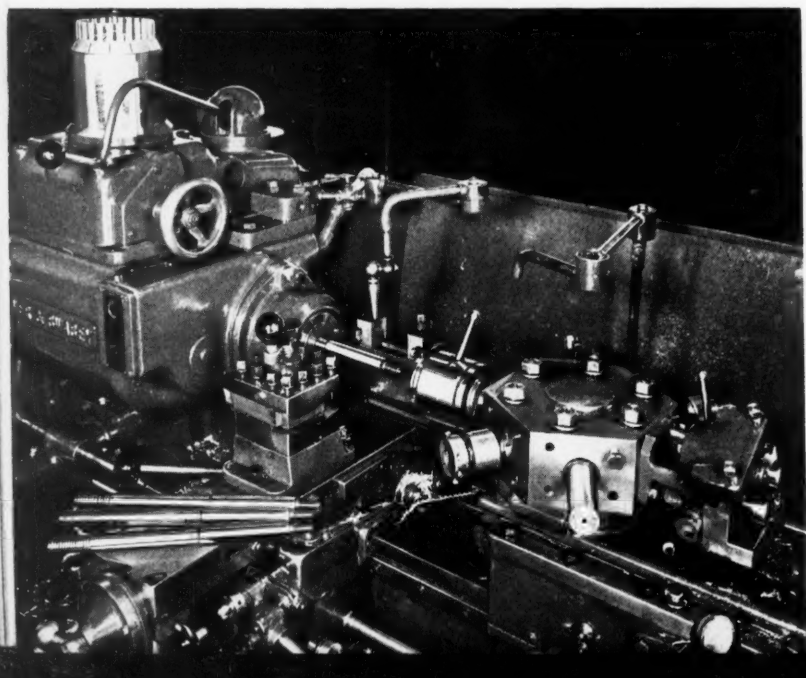


Fig. 9. Threaded Shafts for Anti-aircraft Guns are Produced from Hard Manganese Bar Stock by the Turret Lathe Shown

mate settings, and graduated handwheels fine settings of the sheets to be punched. An indexing chart indicates successive turret and table settings on production jobs. This machine has greatly expedited operations previously performed by the use of templets.

One of the latest additions to the stamping equipment of the Arsenal is the Bliss No. 4 toggle press shown in Fig. 11, which is equipped with a Littell stock coiler and automatic feed. Strip steel, 16 inches wide and No. 18 gage, is fed to the die of this press in increments of 16 inches and drawn to the cloverleaf dish shape seen on the feed unit. The stamping is 2 1/2 inches deep and is produced at the rate of 2200 per eight-hour day. The operator pushes an electric button to actuate the feed.

These stampings are later trimmed and then undergo a forming operation, in which the closed end is shaped. Two of these stampings are used to protect three projectiles shipped as a bundle to the artillery division units.

This article would be incomplete without reference to a highly modern welding shop outfitted within the last year for the fabrication of welded gun mounts and other parts. The shop is equipped with twenty-seven arc-welding units, fourteen welding positioners, two shot-blast units, a large furnace for relieving the stress of welded structures, etc. There is also the National gas-cutting machine shown in Fig. 12 being used for cutting out tank track sprockets. The sprockets are first cut to the toothed internal outline, the finish obtained with the torch being sufficiently smooth to render machining unnecessary. When the internal contour has been completed, the outside of the sprocket is cut to a circle. Two blanks are cut at one time as two cutting torches are guided on the sheet stock with the automatic movements of a tracer around a templet on the table at the left. Steel plates ranging up to 12 inches in thickness can be cut with this equipment.

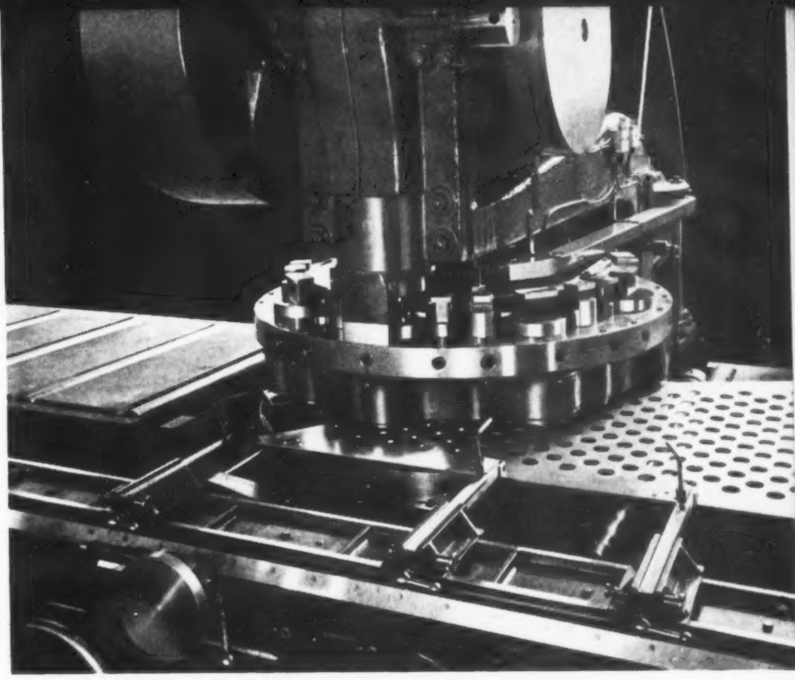


Fig. 10. (Above) Turret-head of a Punching Machine with Twenty-four Punches for the Rapid Cutting of Holes of Different Sizes in Aluminum and Sheet Steel

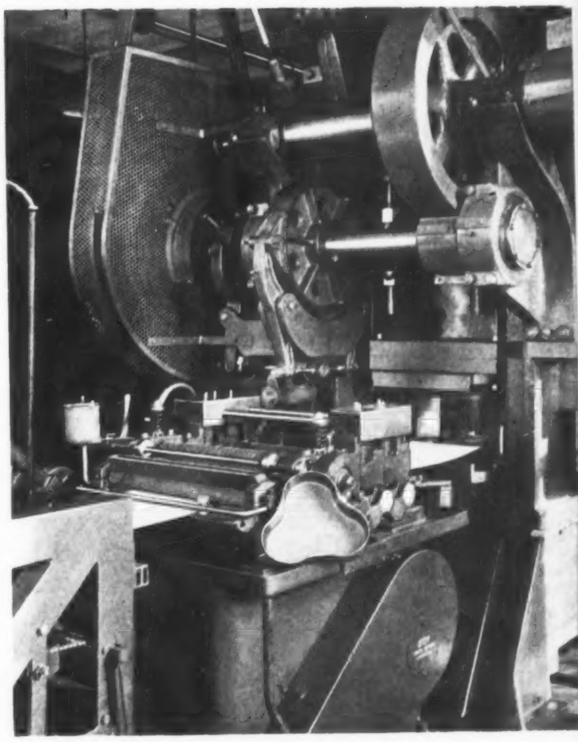


Fig. 11. (Right) Toggle Press and Automatic Feed for the Rapid Drawing of Covers for the Ends of Projectiles

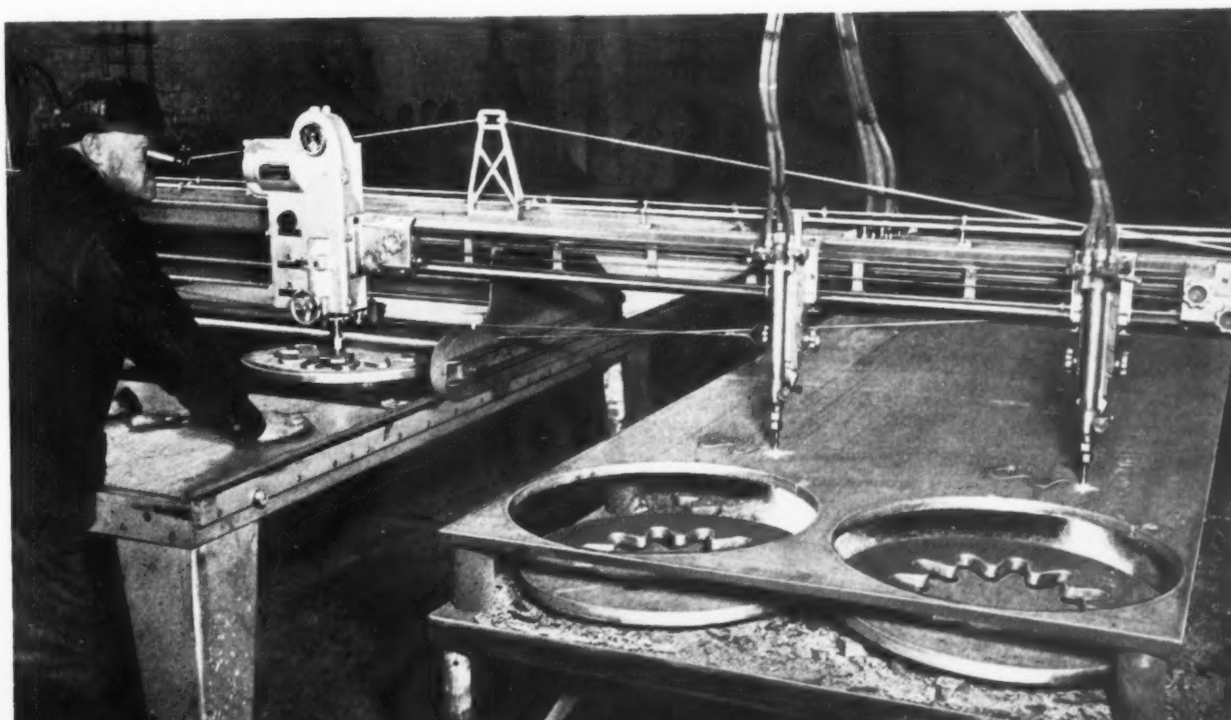


Fig. 12. Automatic Gas-cutting Machine Simultaneously Cutting Two Blanks for Tank Sprockets from Sheet Steel

Sheet-Metal Operations

THE aircraft industry, of necessity, has developed various unique methods of forming sheet metal. Airplanes of any one design are seldom built in sufficient quantities to warrant the making of expensive dies for producing the sheet-metal parts. As a consequence, the aircraft industry has developed methods of using zinc, lead, and steel-faced wood dies which last long enough to produce the number of pieces required. In many operations, rubber is used to force the sheet metal into the die impressions. This subject was dealt with in an article published in March, 1936, MACHINERY, which described practices of the Curtiss Aeroplane Division of the Curtiss-Wright Corporation, Buffalo, N. Y. Several other examples from the same plant are presented here.

A particularly interesting application of rubber for the shaping of sheet-metal parts is illustrated in Fig. 1. At *A* is seen a stainless-steel tube which was bulged out by applying pressure on a rubber pad *C*, placed within the tubing after the latter had been inserted in die *D* and cover plate *E* had been placed on top of the rubber pad.

In such an operation, when the press ram comes down, the pressure applied on plate *E* causes the rubber to expand the sheet metal radially into the die impressions. The die shown is used for producing parts such as seen at *A*. In the case of example *B*, which is made with two bulges in one stroke of the press, a split die is necessary in order to permit the formed piece to be removed from the die. Example *B* is made from flat steel rolled into a tube.

Parts of this type are made from Inconel, as well as from stainless steel. The examples shown were produced from material 0.035 inch thick, and the bulges are about 1/4 inch high. The rubber pad lasts for approximately 600 single bulge pieces, or 50 pieces with two bulges.

A typical operation on a Chambersburg Cecostamp pneumatic hammer is illustrated in Fig. 2. In forming parts from sheet aluminum under this hammer, the weight of the press ram and of the top die member alone are used to shape the work. However, in forming stainless-steel parts, air

Fig. 1. (Above) Die and Rubber Pad Used for Bulging Tubes Such as Seen at A and B

Fig. 2. (Right) Typical Operation Performed by a Cecostamp Pneumatic Hammer, Zinc Dies being Employed for Shaping an Aluminum Sheet

in an Airplane Plant

pressure developed in an overhead cylinder is applied to the ram, so as to increase the force of the blow. On the piece produced in the operation illustrated, the grooves are about 1 inch deep. However, some pieces are drawn as much as 12 inches in this type of operation. The over-all dimensions of the work piece shown were approximately 36 by 15 inches.

The dies are ordinarily made of zinc or duralumin; but when the material to be formed is of light gage and there are no sharp corners, a lead punch is employed. It is produced by pouring molten lead directly into the die, the lead being sufficiently plastic so that the punch can be worked to the proper size by using it several times for striking material of the required gage into the die. Cecostamp hammers, of which there are three in the plant mentioned, are also employed for performing straightening operations. The largest of the three hammers has a bolster area of 66 by 48 inches.

Press brakes are used to form long shapes, such as seen at the front of the Cincinnati brake in Fig. 3. All these pieces were formed by means of the V-punch and corresponding die seen mounted on the machine. Eight bends were made in shaping the piece that stands in a vertical position in the right foreground, a steel mandrel being used for the final closing operation. The machine has a spread of 14 feet.

Another press brake of identical design is equipped with a steel channel on the bolster containing rubber. When punches of wood or steel attached to the ram exert pressure on sheet metal laid on the channel, the sheet metal is pressed into the rubber to obtain the desired shape. Aluminum, duralumin, steel, and stainless steel are all formed by means of press brakes.

The cutting of flat sheets of heat-treated aluminum into irregular pieces, disks, etc., is readily accomplished by employing an Onsrud router, as shown in Fig. 4. This device, which is equipped with a pneumatic turbine type motor, is attached to the outer end of a hinged arm, mounted on a vertical column. Thus the router can be readily

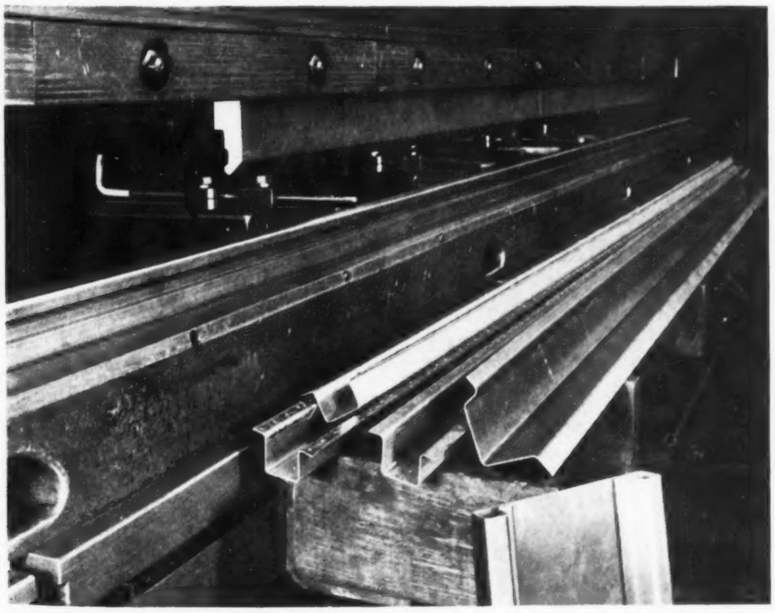


Fig. 3. (Left) A Variety of Long Sheet-metal Pieces Bent to Required Form on a Press Brake

Fig. 4. (Above) Hardened Aluminum Sheets are Cut out to Regular and Irregular Outlines by the Use of an Air-driven Onsrud Router

swung in any direction to follow the outline of wooden templets that are clamped on top of the sheets being cut out.

In the illustration, six disks 28 inches in diameter are being simultaneously cut out of aluminum sheets stacked on top of each other. The 5/16-inch diameter cutter is guided by a collar on the cutter-spindle as the collar is moved in contact with the wood templet.

* * *

Glycerine in Grease Lubricants

In a study recently prepared by Dr. Georgia Leffingwell and Milton A. Lesser on the subject of glycerine in modern lubricants, it is pointed out that glycerine plays a wide and increasingly varied role in the field of lubricants for practically every purpose. Because of an unusual combination of properties and characteristics, glycerine by itself is a valuable lubricant, and, in combination with other materials, especially petroleum products, it is an important constituent of many lubricants used both in heavy machinery and in delicate instruments. Moreover, glycerine is used for many purposes where other lubricants would not be suitable.

Glycerine (glycerol) is a clear, oily, hygroscopic liquid. Its viscosity and specific gravity depend upon its purity and degree of dilution. Glycerine mixes with water and with alcohol, but not with some organic solvents, such as benzine and ether, nor with certain fixed oils. This latter characteristic is important in fields where oils or greases cannot be employed as lubricants. The low freezing point of glycerine is also a most important factor, as is its high boiling point. The fact that glycerine, even though it is a product of vegetable oils and animal fats, does not spoil and turn rancid, is another important point.

It is only within recent years that the important role played by glycerine in modern lime-base and soda-base greases has been recognized. Most of the commonly used lubricating greases are either lime-base or cup greases, which consist essentially of petroleum stiffened with calcium soap, or soda-base or fiber greases in which the stiffening agent is sodium soap. In the manufacture of these greases, glycerine is found as a by-product of the saponification processes used.

It has been pointed out by investigators that the presence of glycerine in grease is of considerable importance; in fact, it is a major constituent of soda-base greases. The glycerine aids in stabilizing the structure of the grease, reduces changes in consistency, increases the lubricating power, prevents increase in the coefficient of static friction on heating, and reduces the susceptibility to the absorption of moisture. Greases containing two or three times as much glycerine as sodium soap are much better lubricants than those that contain merely equal amounts of glycerine and soap. If the glycerine content is greater than two or three times the sodium soap content, the lubricating value again decreases. This applies to the soda-base greases.

In studying the lubricating properties of lime-base greases, investigators have also found that glycerine plays an important part. The presence of glycerine lowers the coefficient of friction at temperatures below 90 degrees C. Grease containing glycerine does not, however, show an increase in lubricating power between 30 and 60 degrees C., such as is exhibited by greases with a high ratio of water to soap. In the presence of glycerine, it has been observed that a greasy film is deposited at high temperatures.

* * *

New Method for Finishing Castings

A new method for obtaining a finish on castings by dipping them in a solution has been developed by New Wrinkle, Inc., Dayton, Ohio. This process consists of three simple steps: First, the casting is dipped into a thin solution of the finish. Second, it is placed on a slightly inclined, screen-covered rack, so that the surplus solution or paint will be returned to the dipping tank. In this way, the finish sets in a few minutes. Third, the casting is sprayed with a material that readily adheres to the still wet surface. A baking operation follows this spraying.

The advantages claimed for the new process are low cost, rapidity of finishing operation, a saving of from 25 to 40 per cent in the cost of finishing materials, complete surface coverage, reduction of rejects, and the use of inexpensive equipment.

As an example of the value of the new process, the following is quoted: In Ohio, a manufacturer of water heaters finished the doors for these heaters by the dry spray method. Production under this method was 100 pieces an hour, with 20 per cent rejects. With the new process, the production has increased to 200 pieces an hour, with no rejects.

* * *

Giant Metal Sphere Used for Storing Hydrogen

A sphere with a capacity of close to 34,000 cubic feet for storing hydrogen gas to be used in furnaces employed in the manufacture of tungsten carbide for cutting tools has been built for the Carboloy Company, Inc., Detroit, Mich. This sphere is 40 feet in diameter. In constructing it, the builder of the sphere, the Chicago Bridge & Iron Co., used General Electric welding equipment. Steel plates 5/8 inch thick were employed. They were shaped and cut to size at the Chicago Bridge & Iron Co.'s plant and then shipped to Detroit, where they were assembled at the Carboloy plant.

Design of Universal Drill Jigs

A Detailed Review of the Factors to be Considered in Designing Drill Jigs that Combine Economy with Operating Efficiency—Second of Two Articles

By JOSEPH I. KARASH, Tool Design Department
Reliance Electric & Engineering Co.
Cleveland, Ohio

IN the first installment of this article, published in November MACHINERY, the general principles upon which the design of universal drill jigs is based were explained and some simple types, designed to promote interchangeability, were described. The present article will continue to discuss methods for locating the work in jigs of this type.

Case III — Concentric External Location from Top Plate

In Fig. 11 is shown a part that will require the drilling of holes concentric with the finished outside of the work. In Fig. 12 is shown a design of top plate and adapter for locating this work from the top plate.

The concentric locator is a ring machined on the inside to fit over the outside of the work. This ring is screwed and doweled to the top plate and becomes an integral part of it.

Plane of Work—It is advisable to use this type of design only when the finished side of the work is in an "up" position, with a small face area adapter. Unless the work comes "home" against the top plate, it will not be in a true horizontal or concentric position.

Chip Disposal—Since the work is located from the top plate, the chips will fall free of the locator.

Locator Lead—In this type of design, the operator cannot see the locating ring, so an ample lead must be provided on the locator. The length of the lead on the locator is not limited by the thickness of the work, as the locator can be allowed to overhang, as shown in the illustration.

Interchangeability — The interchangeability of the top plate is limited, because the locating ring is really an integral part of it; but the top plate can be turned over and the other side used, which is entirely free from encumbrances. The adapter used in this case is a simple dummy adapter.

Case IV—Concentric External Location from Adapter

In Fig. 13 is shown a design of top plate and adapter for locating the work in Fig. 11 from the adapter. As shown in the illustration, the adapter is machined to fit over the outside of the work.

Plane of Work—This type of design should be used only when the finished side of the work is in a "down" position. Unless the work comes home against the face of the adapter, the work will be in a tilted position and also will not be concentric with the bushings.

Chip Disposal—Precautions must be taken to provide for chip disposal, because the locators are below the drill bushings and consequently in line with the falling chips. Should any chips settle on the locating surfaces of the adapter, they will affect both the plane and the concentricity of the work. As shown in the illustration, the adapter can be cut away below the drill bushings to allow the chips to fall clear. A trough should be cut between the edge used for concentric locating and the surface used for horizontal support of the work. The cutting of this trough will eliminate a corner where chips can settle. The total area of the horizontal supports should be kept to a minimum, to reduce the possibility of chip trouble.

Locator Lead—In this type of design, the operator places the work in exact position before closing the jig. A lead is provided on the sides of the concentric location face; this need not be very long. The relative amount of lead shown in the illustration will be found satisfactory.

Interchangeability—In the design being considered, the top plate retains its property of interchangeability; but the adapter is, in reality, a single-purpose tool, and has practically no possibility of interchangeability. Since the adapter cost is only a fraction of the top plate cost, it is good practice to limit the interchangeability of the adapter rather than that of the top plate.

From the examples shown, some conclusions can be drawn. However, these are, in no sense of the word, hard and fast rules. The three following rules should serve as a starting point in design procedure, and should only be used when they seem to suit the peculiarity of the work. (1) Concentric location should be from the member used to establish the horizontal plane; (2) concentric internal location should be from the top plate, where possible; (3) concentric external location should be from the adapter, where possible.

The use of these three simple rules should produce a line of tools that are most practical from the standpoint of speed of operation, accuracy of work, interchangeability, and tool cost.

In the various designs shown, it will be noted that in every case the work projects in front of the top plate. (See plan views.) This enables the operator to grasp the work and eliminates the possibility of pinching his fingers in the jig. It also greatly facilitates the operation of the jig. In the cases where the concentric location is from the top plate, projection of the work is necessary, as there is a tendency for the work to cling to the concentric locator. Unless the work projects in front of the top plate, the operator is forced to reach up under the top plate and pry the work loose.

There are occasional jobs that have both an internal and an external finished surface, thus giving the tool designer a choice for using either in concentric locating. It will be found that locating the work internally will generally produce the best results.

Radial Location in Universal Jigs

By radial location is meant the position of the work in the horizontal plane with relation to the drill bushings. In drilling work that is entirely concentric, the radial location is, of course, immaterial. However, in drilling work that is not entirely concentric, the relation of the contour of the work and the drill bushings must be established. An example of work that is not entirely concentric is shown in Fig. 14. It is more difficult to get accurate radial location than concentric location of holes. The reason for this is that the finished hole in the work used for concentric location will vary with relation to the contour of the work because (1) the casting itself will vary; and (2) there will be a certain amount of chucking variation in the machining of the work.

Since radial locators must not bind the work on the concentric locator, the radial locators must provide a minimum clearance over the maximum casting and chucking variation. In the radial location of work, there are only two fundamental methods that can be used: (1) The radial location will be accomplished from the top plate; or (2) it will be done from the adapter. Examples are given to illustrate both methods of radial location.

Radial Location from Top Plate

In Fig. 15 is shown a design of top plate and adapter to locate the work in Fig. 14 from the top plate. The work is located concentrically by a plug

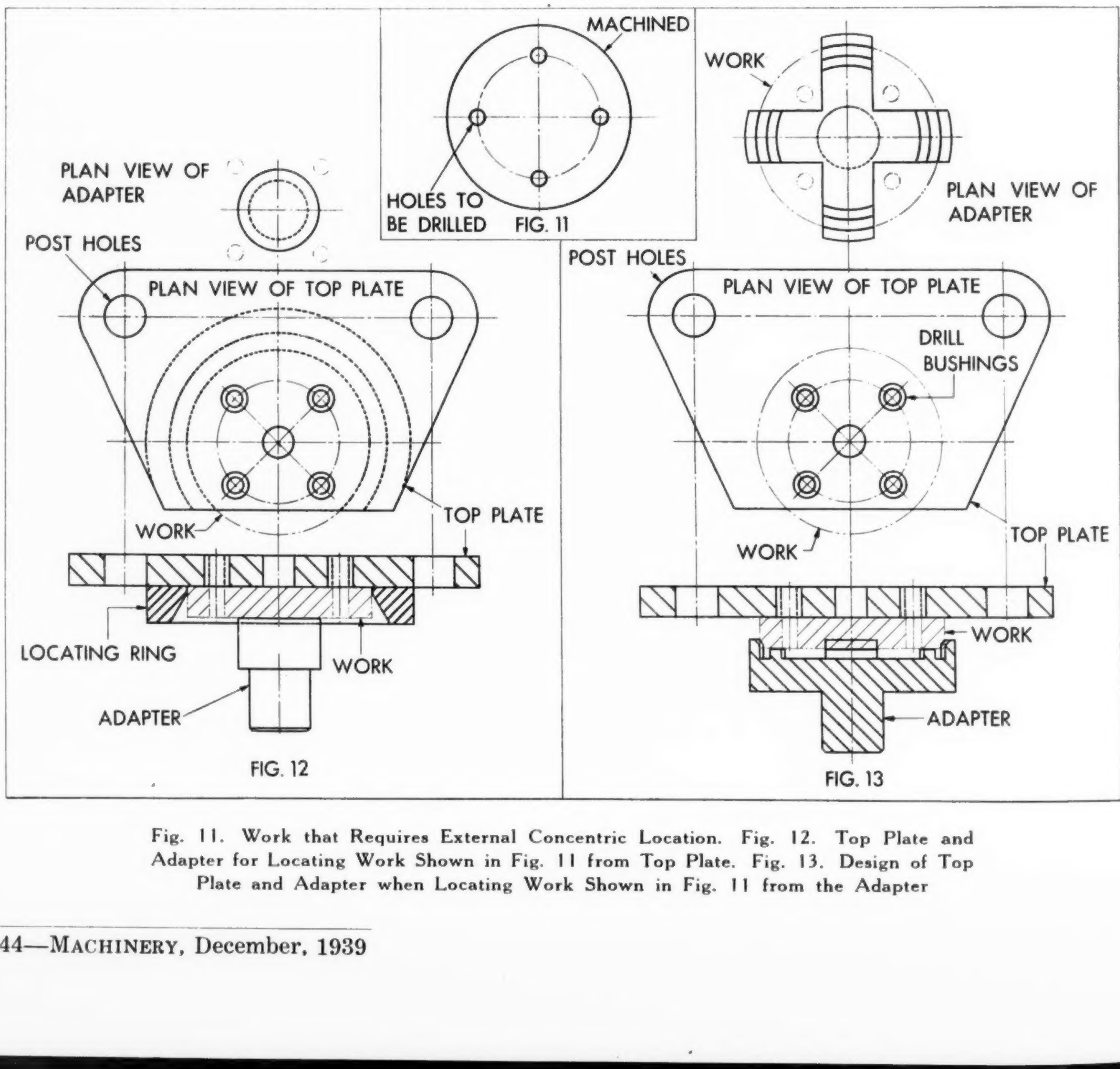


Fig. 11. Work that Requires External Concentric Location. Fig. 12. Top Plate and Adapter for Locating Work Shown in Fig. 11 from Top Plate. Fig. 13. Design of Top Plate and Adapter when Locating Work Shown in Fig. 11 from the Adapter

in the top plate center hole. The radial locating is done by screwing and doweling blocks of steel to the top plate. Clearance must be provided between the locating blocks and the work, as already explained.

It will be noted that the radial locators extend an appreciable distance below the top plate. They should be made long enough so that the work can contact the locators when the top plate is in an "up" position. In this way, they help to locate the work when it is placed in the jig. At first glance, this may hardly seem necessary, but in operation, it will be found a great convenience. Since the radial location blocks are secured to the top plate, there is no problem as to chip disposal.

Radial location from the top plate will reduce interchangeability, because the blocks are an integral part of the top plate. Interchangeability is practically limited to turning the top plate over and using the other side.

Radial Location from the Adapter

In Fig. 16 is shown a design of top plate and adapter for locating the same work from the adapter. The work is located concentrically by a plug locator. Blocks of steel secured to the ends of the adapter arms locate the work radially. Suitable clearance should be provided between the radial locators and the work. The radial locators should not be higher than the thickness of the work, as this would prevent the top plate from clamping the work in place. A trough should be cut at the end of the adapter arms, so that there will be no corner into which chips can gather.

This type of design leaves the top plate free of any encumbrances so that there is perfect interchangeability of the top plate; but the adapter is essentially a single-purpose tool, with little possibility of interchangeability, obviously the lesser of two evils.

From the two examples shown, the conclusion can be drawn that it is best practice, for radial location, to locate from the adapter, principally because of the fact that this results in greater interchangeability for the top plate.

It should be kept in mind that the radial locating need not be done from the same member as the concentric locating; for example, the concentric locating can be done from the top plate and the radial locating blocks may be secured to the adapter.

Another method of radial location, which is sometimes necessary due to extreme casting and chucking variation, is to use spring-actuated movable blocks. In addition to the increased initial

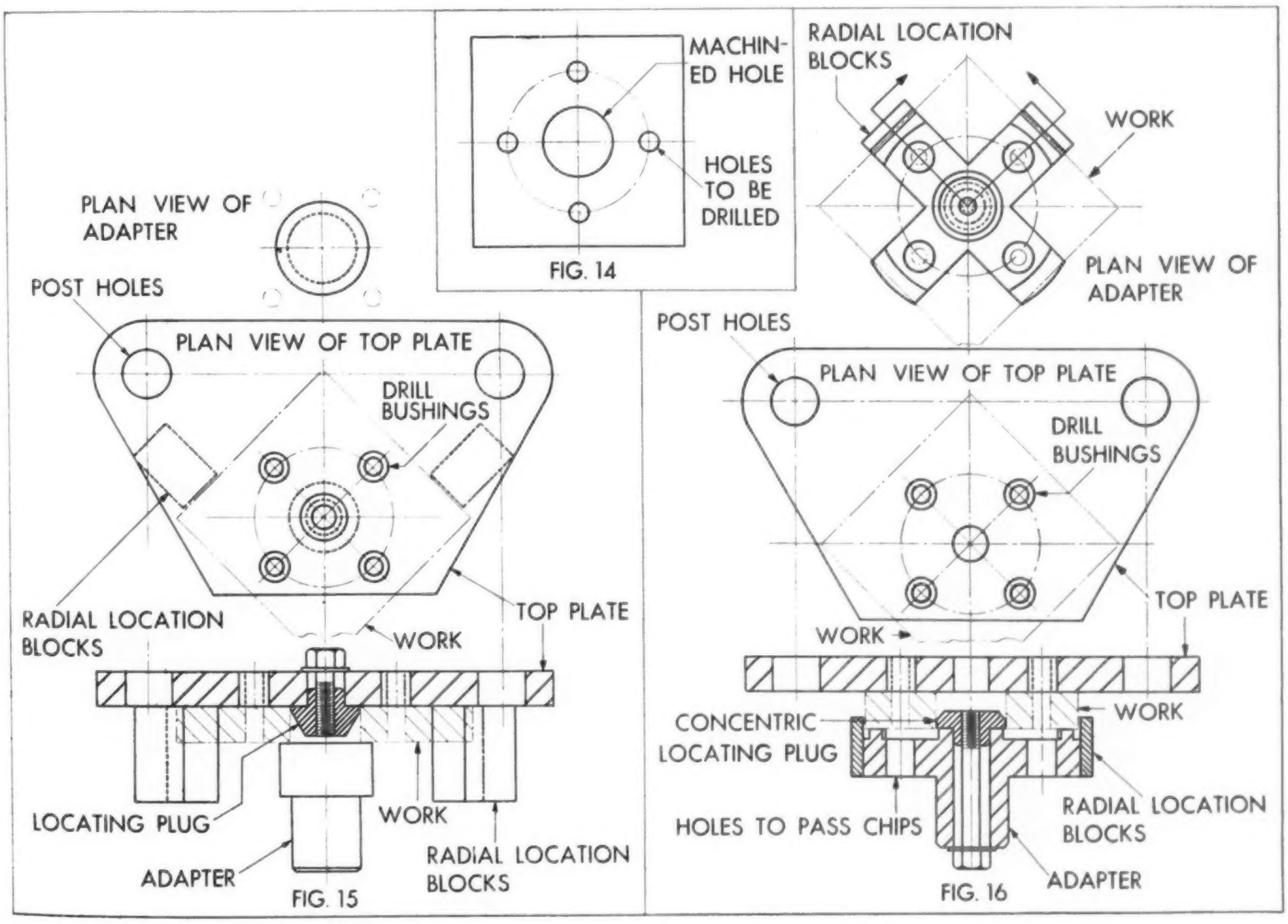


Fig. 14. Work that Requires Concentric and Radial Locating Means. Fig. 15. Top Plate and Adapter for Locating Part Shown in Fig. 14 from Top Plate. Fig. 16. Top Plate and Adapter when Work Shown in Fig. 14 is Located from the Adapter

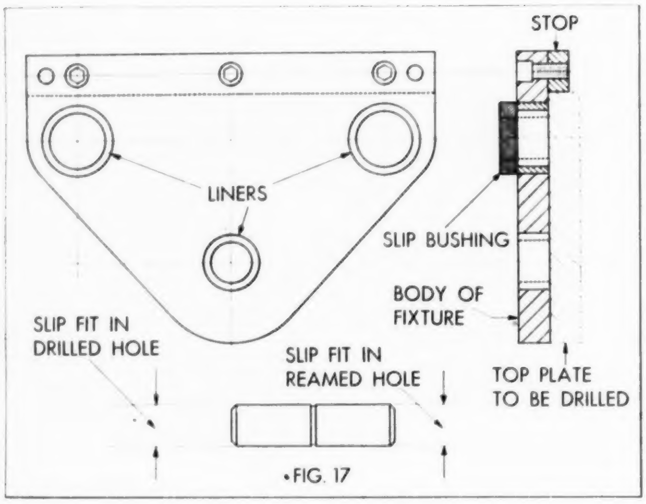


Fig. 17. Jig for Drilling Post Holes and Center Indicating Hole in Top-plate Blanks

cost, the disadvantage of spring-actuated blocks is that they have a tendency to jam the work on the concentric locator.

Coolant Reservoir

When a coolant is to be used during a single-spindle drilling operation, it is satisfactory to direct the coolant nozzle against the drill body. However, in the case of a multiple-drilling operation, a coolant nozzle for each drill would make a rather awkward set-up.

A more satisfactory method of directing the coolant is to provide a ring, flame-cut from 1/2-inch boiler plate. The inside diameter of this ring should be large enough to encompass all the drills in the set-up. If this boiler-plate ring is laid on top of the top plate, it forms a reservoir which will feed all the drill bushings. The coolant fluid can be poured into the reservoir with just one coolant nozzle.

The coolant ring should not be screwed to the top plate, because this would interfere with the interchangeability of the plate. Another disadvantage of securing the coolant ring to the top plate is that this would make it rather difficult to remove chips from the coolant ring. If the coolant ring is not fastened to the top plate, the chips can be swept off the jig by occasionally sliding the coolant ring. (Note that headless drill bushings were suggested earlier in this article.)

The coolant ring described is not intended to be a single-purpose tool, but rather a universal auxiliary piece of equipment to be kept at the drilling station.

Tools for Making Top Plates

All top plates have many points in common. It is possible to take advantage of this similarity by making simple tools which will greatly facilitate the manufacture of top plates. The drill plate and boring fixture to be described have been designed primarily to facilitate the making of individual top plates and to shorten the set-up time required in carrying through this work. Because of the simplicity of the plate and fixture, the initial cost of these tools should be justified, even though they will be used only occasionally.

It will be noted that all the top plates have one outstanding point of similarity. They all require the boring of two holes to fit over the posts of the universal jig, and the boring of a third hole which will serve as a center for locating the drill bushings. A top plate with these three holes bored is shown in Fig. 2 of the first installment of this article (see page 163 of November MACHINERY). These holes must be accurate as to size and relation to one another.

Simple Drill Plate

A simple plate jig is shown in Fig. 17 for drilling and reaming these three holes. The drill plate should be equipped with liners and two sets of bushings, so that both the drilling and reaming operations can be done through bushings. The illustration also shows one of the pins that should be provided for slipping through the bushings and the work to prevent the drill plate from shifting during the drilling and reaming operations.

Dividing-Head Fixture

An analysis of the cost of producing small drill jigs will generally show that the greatest item of cost is in the precision-boring of the holes for the drill bushings. In conventional shop practice, such holes are most efficiently bored in a jig-boring machine; but the average manufacturer does not have the large volume of tool work necessary to justify the purchase of such equipment.

However, the accurate boring and positioning of bushing holes can be efficiently done in a mill-

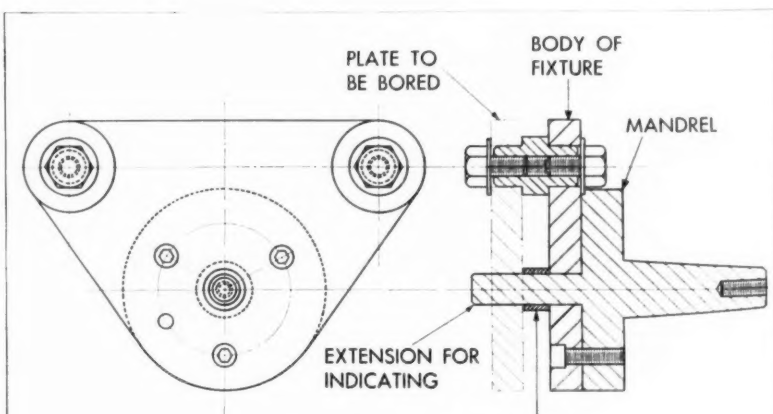


Fig. 18. Precision Boring Fixture for Top Plates

ing machine by taking advantage of the fact that the dividing head can be indexed very accurately. If a top plate were mounted in the dividing head so that the center hole of the top plate coincided with the center line of the dividing head, it can be easily seen that by indexing the dividing head, the top plate could be positioned, relative to the boring tool, so as to produce holes accurately spaced on any desired bolt circle. The table of the milling machine would remain in a fixed position throughout the entire operation.

A very simple top-plate holding fixture can be made for the dividing head that will make it possible to secure the top plate quickly and accurately to the dividing head, so that the center hole in the top plate and the center line of the head will coincide. Such a fixture is shown in Fig. 18.

Fig. 19. Milling Machine Set-up for Precision-boring of Bushing Holes

One end of a steel mandrel is machined to fit the tapered hole in the dividing head. The other end is machined for a snug fit in the drilled and reamed center hole of the top plate. The mandrel is then secured to the body of the fixture with socket-head cap-screws and a dowel. The three holes required in the body are drilled and reamed with the plate jig previously described, thus eliminating an expensive precision boring operation. Two machine steel plugs are provided to fit the corner holes of the fixture body. These plugs act as spacers and also serve to secure the top plate to the fixture body.

In order to produce a complete top plate, the following procedure is suggested: (1) The top-plate blank is drilled and reamed with the plate jig to provide the two post holes and the center hole; (2) the top plate is blued and the proposed bushing holes laid out and scribed; (3) holes are drilled through the top plate in the proper position for the bushings, using a drill size considerably smaller than the full size of the bushing holes; (4) the top plate is mounted in the dividing head, using the top-plate holding fixture; (5) a fly cutter is inserted in the spindle of the milling machine and positioned in relation to one of the proposed bushing holes; (6) a light trial cut through the top plate is taken; a plug is wrung into the hole bored; a micrometer measurement is taken across the plug and shaft extension of the fixture mandrel. Then the table is repositioned so that the exact radius desired is established. When the radius is once established, the table is locked in place and the set-up is complete. The proposed bushing holes can then be accurately positioned in relation to the fly cutter by indexing the dividing head.

A typical boring set-up, using the work-holding fixture, is shown in Fig. 19. The operator is shown measuring across the bushings wrung into the bored holes.

National Association of Manufacturers to Honor Inventors

THE National Association of Manufacturers is planning to make awards to outstanding inventors and research workers in connection with a nation-wide observance of the one hundred and fiftieth anniversary of the founding of the American patent system, which will be commemorated in 1940.

The Association has invited manufacturers everywhere to nominate outstanding inventors and research workers for such awards. Blanks for nominating candidates can be obtained by addressing the Association at its headquarters, 14 W. 49th St., New York City. The awards will be presented on February 27, 1940, at the National Modern Pioneer Dinner, to be held at the Waldorf-Astoria, New York City. At this dinner, inventors and research workers who have been deemed by the Committee on Awards to be particularly outstanding will receive special honors. Leaders in the fields of science and industry will participate in the program to commemorate the founding of the American patent system.

Grinding Large Odd-Shaped Work on Various Types of Machine Tools

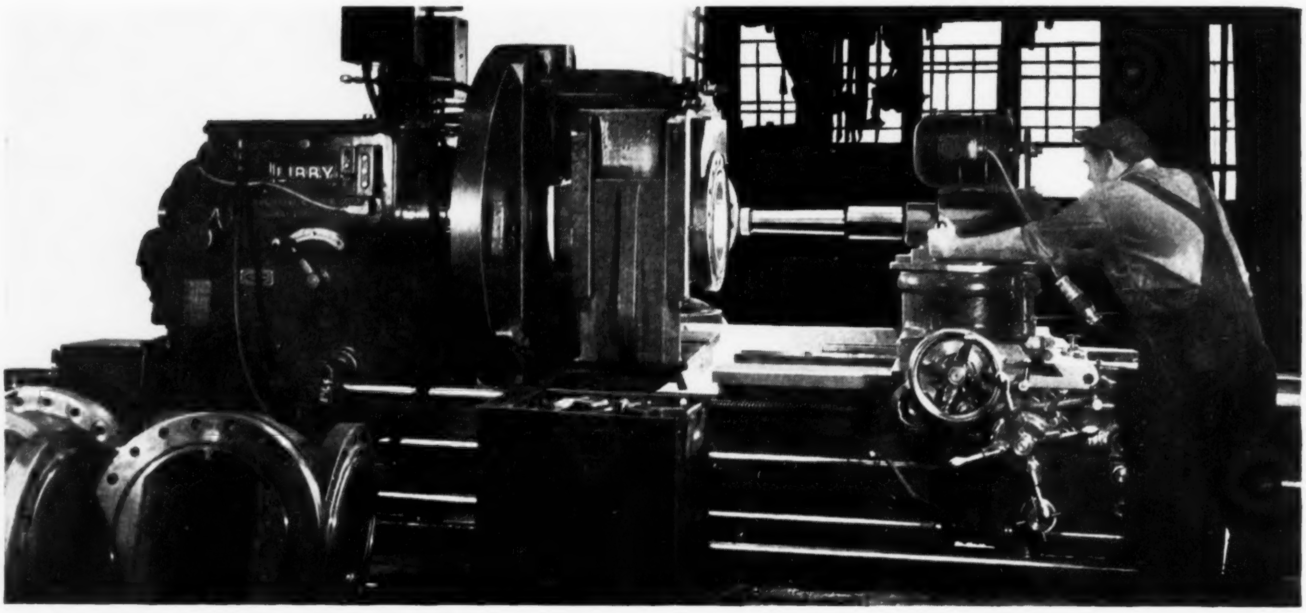


Fig. 1. Grinding the Tapered Seats of an Angle Type Valve in a Turret Lathe Equipped with an Ex-Cell-O Grinding Spindle

TOOL-ROOM lathes, hand screw machines, vertical turret lathes, boring mills, planers, and other non-grinding machine tools are being increasingly equipped with special grinding spindles for operations on large odd-shaped work. The accompanying illustrations show a heavy-duty horizontal turret lathe and a vertical turret lathe provided with Ex-Cell-O grinding spindles for performing operations of this character in the plant of a large valve manufacturing concern.

Globe and angle type valves made by this company are provided with 15-degree plug type seats of Stellite, which are screwed into the valve body,

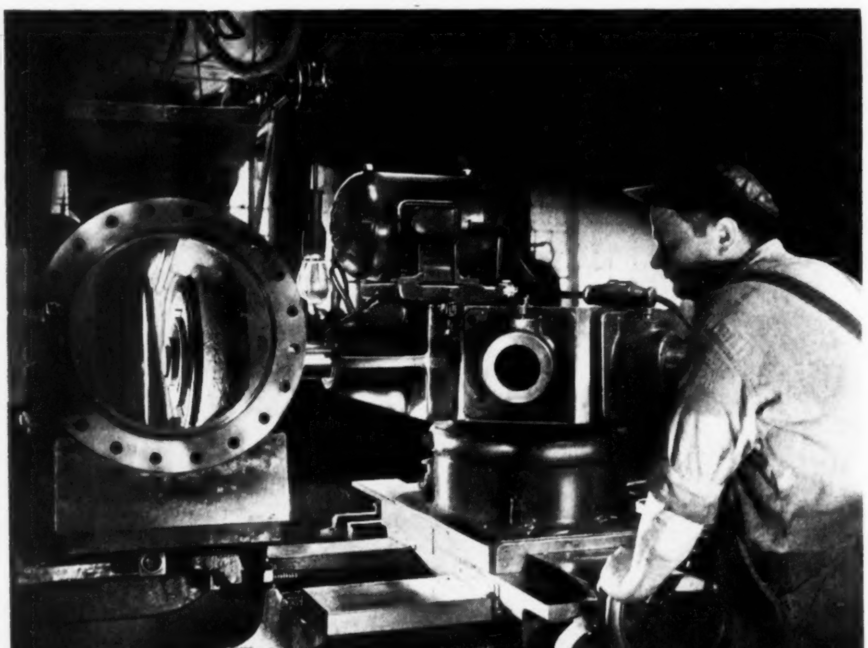


Fig. 2. The Flat Stellite Seats of Wedge Gate Valves are Also Ground in a Turret Lathe by Employing the Front and Back Sides of a Grinding Wheel Mounted on the Turret

seal-welded, and then finish-ground. A Libby turret lathe of 54 inches swing, with an Ex-Cell-O grinding spindle mounted on the cross-slide, as shown in Fig. 1, is used for grinding these tapered seats on cast-steel valves up to 8 inches. The operator oscillates the grinding spindle across the seat by means of a hand-lever. Accuracy of the seat taper and a fine degree of finish are important requirements in this operation. The grinding spindle is driven at a speed of 5000 R.P.M. by a motor mounted on top of the spindle bracket, the power being transmitted to the grinding spindle through a V-belt. Precision ball bearings designed to permit minimum end and radial play enable the spindle to be operated continuously without the generation of excessive heat.

These tapered valve seats were formerly lapped, two days often being required to finish-lap one seat. Even then, the taper and finish were not entirely satisfactory. By the present method, the seat is correctly ground and smoothly finished within two hours, from 0.006 to 0.007 inch of stock being ground off.

The same Libby turret lathe is shown in Fig. 2 equipped for finish-grinding flat Stellite seats in 12-inch wedge gate valves. It is important that the faces of both seats be ground to the required angle to match the mating disk, the total taper of the seats being 2 inches per foot. About 0.002 inch of stock is ground off the seats to eliminate distortion caused by fitting the Stellite rings into the valves.

Grinding is first done on the valve seat nearest to the operator by employing the back side of the grinding wheel, as seen in Fig. 2. Then the opposite seat is ground by using the front face of the wheel, after first swinging the work-holding chuck through a short arc to bring the second seat at right angles to the grinding spindle. The chuck is locked in each of its two grinding positions.

This grinding spindle is driven at a speed of 3200 R.P.M. by a motor mounted on the spindle bracket attached to the regular turret of the machine, which also transmits the power to the grinding spindle through a V-belt. The finishing of these seats in wedge gate valves was formerly done by hand on a bench. By adopting the method shown in Fig. 2, from four to five hours time is saved in the assembly of each valve.

Fig. 3. Finishing the Bore of a Stop Check-valve Liner with a Grinding Spindle Mounted on a Vertical Turret Lathe

Cast-steel liners for stop check-valves are bored and then finish-ground with an Ex-Cell-O spindle on the Bullard vertical turret lathe illustrated in Fig. 3. These valve liners range up to 10 inches inside diameter. They are ground to size within tolerances of 0.001 or 0.0015 inch, depending upon their size. From 0.010 to 0.012 inch of stock on the diameter is generally removed. The spindle runs at 4000 R.P.M.

Much larger work than that shown is generally handled on this machine, such as 16-inch angle type valves, which are made of cast steel and are plunge-ground to an angle of 35 degrees. Work up to 50 inches diameter can be ground, either externally or internally, and holes as deep as 25 inches.

Change Needed in Federal Labor Policy

A BOOKLET entitled "A Change Needed in Federal Labor Policy" has been published as No. 33 in a series prepared by Allen W. Rucker in collaboration with N. W. Pickering, president of the Farrel-Birmingham Co., Inc., from which company copies of the booklet can be obtained. In this study of legislation and labor policies, the authors find that the Administration has caused a steady advance in average factory wage rates in the face of a declining or stationary farm price level, thus intensifying the inequalities already present. Federal legislation causing a reduction in the working week virtually compels the workers, in self-defense, to demand higher wage rates to offset their reduced income due to the shorter hours.

In conclusion, the authors assert that a modification of the present labor legislation would benefit the entire nation. The farmer especially would be the gainer, through the balancing of industrial prices with his income. It should not be overlooked that the farmer constitutes the largest single consumer market of the country.

Engineering News Flashes

The World Over

Automatic Light Control Installed in Office on Pacific Coast

A light control by means of which artificial light is turned on automatically as the intensity of daylight varies has been installed by the General Electric Co. in the office of the Van Camp Sea Food Co., Inc., Terminal Island, Calif. The office in which the installation has been made has an unusual amount of natural illumination, but the natural light varies considerably from one hour of the day to another.

The lighting installation consists of four rows of luminaires, each row controlled independently by photo-electric equipment. Four photo-tubes are used which maintain the desired illumination level at all times. Obviously, the lights next to the windows are turned off first as natural illumination increases, and the inner rows of lights are turned on first when the natural light decreases.

Micarta as a Bearing Material to Carry Heavy Loads in Ball Mills

Bearings of micarta are now being used instead of metal bearings to carry the heavy loads in ore-crushing mills. Water instead of oil keeps the bearings cool. The water carries away from the bearing surfaces the large quantities of dust that enter from the ore-crushing mill. In the past, the wear of metal bearings, due to dust, has been very rapid; whereas, according to the Westinghouse Electric & Mfg. Co., a micarta bearing, after eight months' service, showed no appreciable wear. The micarta bearings have also reduced the power requirements by 30 per cent, because of their low frictional resistance. These bearings carry a load of 80,000 pounds, turning at 18 revolutions per minute. They are semicircular shells, one being 44 inches in diameter, 1 inch thick, and the other 22 inches in diameter, 1/2 inch thick.

Automatic Machine that Makes, Fills, and Seals Milk Containers

The accompanying illustration shows an automatic machine that forms cardboard blanks into containers, automatically paraffins them, fills them with milk, seals them, and delivers them to cold storage. The machine handles forty-five containers a minute. It was built by the General Machinery Corporation, Hamilton, Ohio, for the Reed Container Sales Corporation, New York City.

Apart from being an interesting example of automatic machine equipment, the machine is also interesting from the point of view of the many materials used in its construction. Extensive use is, of course, made of stainless steel. The main driving cam, and the thirty-four auxiliary driving and closing cams, are made from heat-treated Meehanite metal.

Machine that Automatically Makes, Fills, Seals, and Delivers Milk Containers to Cold Storage

Device that Converts Heat Directly into Electricity

Direct conversion of heat into electricity by means of a thermo-electric apparatus was demonstrated at the exhibit of the Westinghouse Electric & Mfg. Co. at the New York World's Fair. The mechanism is heated by a gas flame and cooled by natural convection of air. Three disks of thermoelectric elements, one above the other, formed of heating fins on the inside and cooling fins on the outside make up the "doughnut." Between the cooling and heating fins are pairs of conductors made from chromium-nickel alloy and a combination of aluminum-nickel alloy and a copper-nickel alloy. These pairs of leads create a very small voltage. In this case, many pairs of leads are used to create a usable voltage for visible application. About three volts are generated by this machine, which is used to supply power to an auto fan or a small light. The machine will run continuously as long as the flame is applied. There is as yet no practical application of the development.

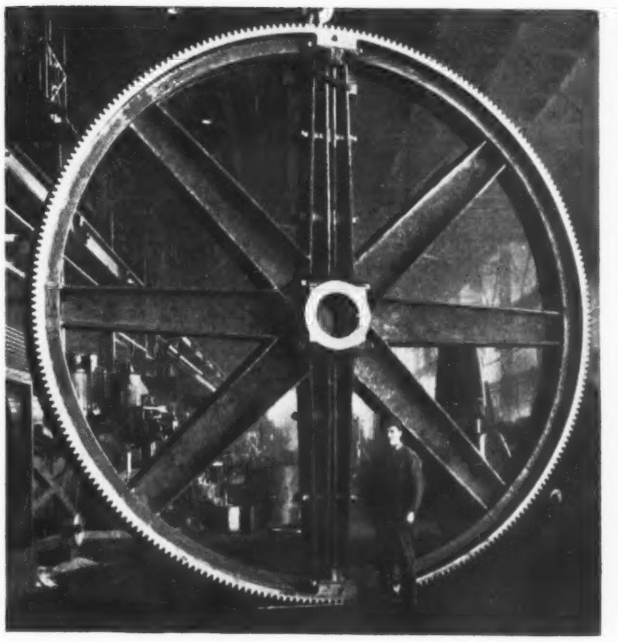
One-Horsepower 10-Miles-an-Hour Automobiles in Production

From England comes the news that a Birmingham firm, well known as a builder of passenger automobiles and trucks, has placed in production a small automobile designed especially for use by children. This car weighs 150 pounds. It has a one-horsepower gasoline engine capable of a maximum speed of ten miles per hour. The car, which is an open two-seater, has, in miniature, all the equipment of a full-sized automobile, in a form that can be handled, it is said, by a child of six.

Fuel Savings Due to Operating a Turbine-Generator in Hydrogen

The latest advance in power plant equipment design is a turbine-generator operating in hydrogen. One of these units has been in successful operation for some time at the East 40th St. Waterside station of the Consolidated Edison Co. in New York City. Built by the General Electric Co., this unit is known as a "topping" turbine, because it has been superimposed on one of the existing installations. Annual savings of $500,000 in coal alone are expected. The turbine uses more than one million pounds of 900 degrees F. steam at 1200 pounds gage pressure in producing approximately 53,000 kilowatts per hour.

The chief advantages of operating the turbine-generator in hydrogen are the high speeds that can be maintained; the reduction of windage losses; the longer life of winding insulations, as oxidation is prevented; and the elimination of fire hazard, due to the fact that hydrogen will not support combustion.



Sykes Continuous-tooth Herringbone Gear Slightly over 18 Feet in Diameter, with 25-inch Face, Made by Farrel-Birmingham Co., Inc., for Driving a Rolling Mill

18-Foot Diameter Continuous-Tooth Herringbone Gear

The 18-foot diameter continuous-tooth herringbone gear generated by the Sykes process, shown in the accompanying illustration, is made from two steel castings having a total weight of approximately 45,000 pounds. The face of the gear is 25 inches. The two halves are carefully machined and bolted together with fitted bolts. The peripheral velocity of the gear is approximately 1130 feet per minute. It was made by the Farrel-Birmingham Co., Inc., Buffalo, N. Y., for a rolling-mill drive.

Remarkable Machine Designed to Braid Glass

Braiding glass sounds like an unusual operation. Today, however, with glass produced in the form of fibers, threads, and strands, glass braiding is perfectly practicable. As part of the glass center exhibit at the New York World's Fair, a twenty-eight-strand high-speed braiding machine was shown braiding glass fiber for use in insulating conductors. The machine, built by the New England Butt Co., produces approximately 85 feet of glass braid per hour. As installed at the Fair, it was provided with a General Electric automatic time switch, which, every five minutes, changed the operation of the machine from high to low speed, the purpose of the low speed being to permit the visitors to see how the glass strands were braided together.

EDITORIAL COMMENT

When we say that in order for industry to function in a normal manner, so that an ever increasing number of people may be employed, industry must be encouraged rather than hampered—what do we mean? We mean that the initiative, enterprise, and abilities of the men who manage industrial enterprises must be encouraged rather than hampered. There is no other solution to our unemployment problem, since the men who manage industrial enterprises have proved to be the only ones capable of providing self-supporting jobs for those who are not able to provide jobs for themselves.

Give the Men Able to Provide Jobs for Others a Chance

The following statement by a well-known industrial executive is very much to the point: "The men who manage industry are the only ones who can make any appreciable inroad on the problem of reducing the millions now unemployed; but if they are to function, they must be permitted to use their abilities without unnecessary hindrances. They must not be hampered in their every move by Governmental interference, taxes, and unreasonable labor-union regulations. They must not be forced to employ an entire accounting department simply to keep accounts for the Government. They must have some right to say whom they shall, and whom they shall not, employ, for the best interest of their respective enterprises. They must be permitted to devote their thought and energy to the building of a business that creates employment, rather than to keeping informed on Government regulations and to fighting unjust and unwarranted Governmental interference."

Individual enterprise rather than Governmental activity has created what we term the American standard of living. If we want again to see the American people employed as they have been in the past, making a good living and developing a still higher standard of comfort, we must accept the fact that industrial employment and industrial production are not created by the Government, but by individuals capable of employing others. Our high standard of life is not the result of Governmental action, but rather of men who have conceived of new enterprises and who have had the ability to put their ideas to work.

Jobs are Created by Industry—Not by Government

Again quoting the industrial executive: "An automobile for the average man was conceived of and built by Ford, not by the Government. All that the Government has done has been to increase its cost by about one-third, and to increase the cost of gasoline and oil to more than twice what it would cost if it were not burdened by unreasonable taxes at every step of its production and distribution.

"The radio was not produced by the Government; the fundamental idea was that of Marconi, and thousands of others have perfected it. All that the Government has done has been to increase the cost of radios and of broadcasting, and to litter up much of the time on the air with political propaganda.

"Our present standard of living was not made by Government; it was made by the industrial manager who had the ability to develop his ideas of better and cheaper goods for more and more people, and who had the ability and courage to employ others and to agree to pay them wages for making these goods before he could bring in any money from their sale. All that the Government has done has been to tax the produced goods to the extent of more than one-third their value, thereby reducing the standard of living by nearly that amount.

Who is Responsible for the American Standard of Living?

"Our railroads are a shining example of Governmental regulation. In no country in the world did private initiative create, within a comparatively few years, such a railroad system as that of the United States. Some of the transcontinental lines were aided and encouraged by the Government of the early days in the building of these roads by land grants; but, apart from this, which affected only some of the western systems, what has the Government done to aid in the development of American railroads? It has made regulations that have caused practically all the railroad systems to become insolvent, without contributing any constructive ideas."

The inference from the above statements is that if we want increased employment and general industrial prosperity, the Government's policy toward industry must be changed. This is not an expression of political opinion; it is an expression of interest in the welfare of American industry, including those who manage and those who are employed.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices

Automatic Sheet-Metal Riveting Machine Operated by Compressed Air

By PAUL GRODZINSKI

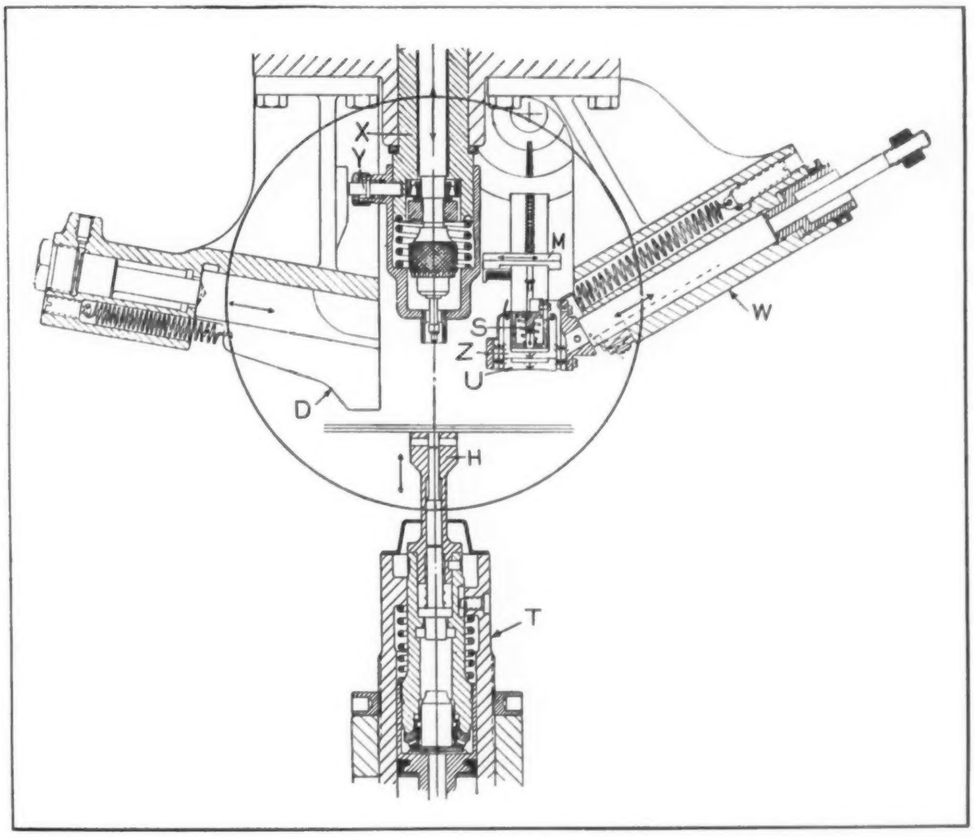
A fully automatic machine for riveting with light metal rivets was developed recently, in which all the movements, with the exception of the rotating drive for the drill, were performed by compressed air. These operations include feeding and withdrawing the drill spindle; clamping the sheets to be riveted, the clamping pressure being applied on both sides of the sheets; feeding the rivets from a drum magazine, also driven by compressed air; feeding a riveting dolly; inserting, driving, and heading the rivets by means of the hammer; and feeding the work to the succeeding stop. This machine, originally designed by Henschel Flugzeugwerke, Germany, and now produced by Frankfurter Maschinenbau, has some unusual features.

A special device is provided which allows the machine to be used for flush-riveting if desired, the latter method being preferable for airplane construction, as it reduces the friction or air drag of the riveted surfaces. The machine will handle rivets ranging from 0.10 to 0.40 inch in diameter. From 900 to 1000 complete joints can be riveted per hour with rivets 1/8 to 0.14 inch in diameter. The riveted joints are made by the machine in exactly the same way as they are made by hand. The machine, however, performs all the required operations automatically without the help of the operator. For hand-riveting, two operators are usually necessary, whereas the riveting machine is controlled by one man, who only has to start the sheets in the machine and regulate its operation. In riveting curved pieces, the sheets are fed by hand.

The various pneumatically controlled devices are shown in the accompanying illustration. The machining operations are performed with the tools in the vertical position, while the sheets are fed horizontally through the machine. The drill press, with the sheet clamping sleeve, rivet magazine and inserting device, is located above the table, whereas the riveting hammer with its separate clamping device is operated from below.

The first operation consists of drilling and countersinking with the vertical spindle *X*, which is automatically fed up and down. During this operation, the sheets are clamped tightly from both sides by a clamping attachment at the left-hand side of the machine and the sleeve *H*, which operates from below.

In the second operation, when the drilling spindle is withdrawn, the rivet feeding device of unit *W* is moved downward by the right-hand oblique slide, taking the rivet from the magazine by means of a knife *M*, and holding it in a pair of tongues in a vertical position above the rivet hole. On the



Cross-section through Drilling Spindle X, Rivet Feeding Unit W, Riveting Hammer and Clamping Unit T, and Dolly D

following downward stroke of the drill-holder, which does not carry the drill into engagement with the work, the rivet is pushed from the rivet guide tongues *Z* through the lower tongues *U* into the rivet hole. After this, the rivet feed is pulled back into its lateral position by means of a spring.

The rivets are fed from a rotating drum magazine, into which rivets of the same size and shape are dumped. They are brought into line at the bottom of the drum and moved continuously forward to the oblique slide, from which they pass with the free shank end directed downward. The rivets thus continue their movement down to the rivet guide tongues. This feeding arrangement can, of course, be used successfully only with commercially perfect rivets. Rivets with chamfered shank ends are preferred for this work.

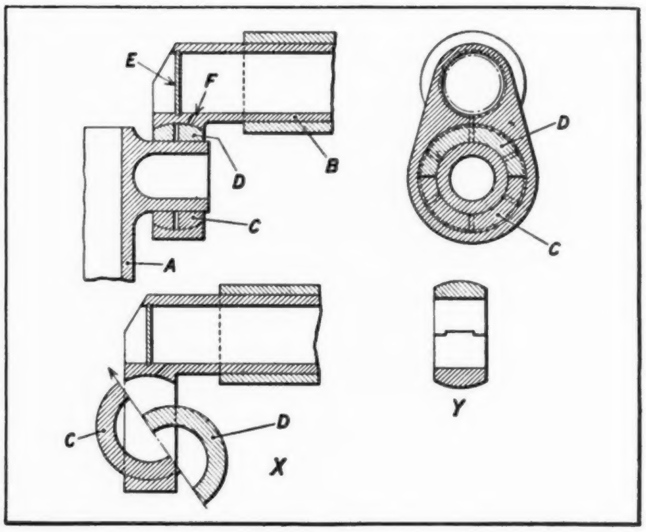
For driving and heading the rivet, the dolly *D*, attached laterally to an oblique slide, is advanced to a point above the die-head. The riveting hammer, beneath the sheets, reciprocates in a vertical direction, striking against the free end of the rivet shank until a flat head is formed. The sheet clamping sleeve around the riveting hammer holds the sheets together with sufficient force to obtain a tight joint. When the rivet is finished, both parts are drawn downward, allowing free passage for the next rivet after the sheets are fed forward by the compressed-air feeding device.

The last operation has recently been modified to provide for a special countersinking and driving operation required for flush-riveting. The material around the holes is "pulled through" while the rivet is driven in. The same devices are employed for feeding and inserting flat-round, half-round, and countersunk head rivets of the same shank diameter. One rivet feeding device and the same guide tongues are used for rivets from 0.10 to 0.40 inch in diameter. The change from one size rivet to another can be made in less than five minutes. The chips produced by drilling and countersinking are removed by compressed air.

One of the special requirements of this riveting method is that the upper side of the structural parts to be riveted must be flat for a distance equal to the width of the rivet guide tongues, the dimensions of which are held to the smallest possible size.

Ball-and-Socket Mechanism for Operating a Sleeve Valve

In the accompanying illustration is shown a ball-and-socket mechanism for imparting a combined oscillating and reciprocating motion to a sleeve valve. This mechanism was patented recently in England. Its most interesting feature is the novel method of assembling the simple but efficient ball-and-socket joint. The sleeve *A* is driven from the rotating crankshaft *B*, the socket being formed in the crank and the ball mounted so that it can slide on a pin projecting from the sleeve.



Ball-and-socket Mechanism for Imparting a Combined Reciprocating and Oscillating Motion to a Sleeve Valve

As shown, the annular ball member is made in halves *C* and *D*. To assemble the joint, one half of the ball member, say *C*, is set in the socket with its axis at right-angles to that of the socket, as illustrated in the view at *X*. The other half *D* is then slid into position in the direction of the arrow, and the two halves turned together through 90 degrees, so that they are co-axial with the socket. The pin projecting from the sleeve can then be inserted in the bore of the ball member, the two halves thus being maintained in the correct position. The two halves can, if required, be tongued and grooved, as indicated at *Y*.

In the arrangement illustrated, the hollow crankshaft is blanked off at *E*, and provision is made for feeding lubricating oil to the joint through the bore of the shaft and the hole *F*.

* * *

Exports of Industrial Machinery Continue to Increase

The United States' exports of industrial machinery in September, the last month for which complete statistics are available, were valued at $23,255,000, an increase of 14 per cent over September, 1938, according to the Machinery Division of the Department of Commerce. Of these exports, power-driven metal-working machinery represented 41 per cent, valued at $9,539,000, a 17 per cent advance over the corresponding figure for 1938.

The value of different types of machine tools exported was as follows: Lathes, $1,444,000; milling machines, $1,814,000; drilling machines, $468,000; vertical boring mills and chucking machines, $499,000; thread-cutting and automatic screw machines, $460,000; and internal grinders, $294,000. Sheet and plate metal-working machines represented a value of $385,000; forging machinery, $75,000; and rolling mill machinery, $1,308,000.

European Thread-Grinding Practice

A Review of the Three Different Methods of Thread Grinding that are Employed in European Practice at Present

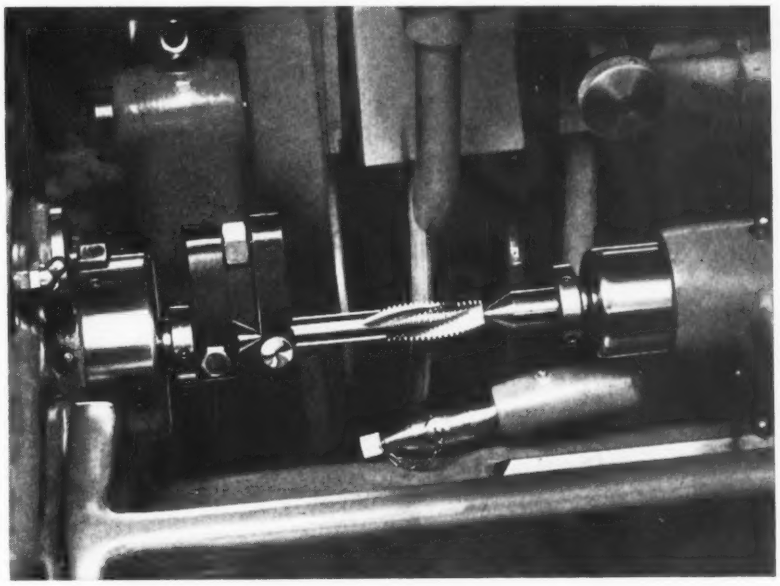


Fig. 1. Grinding the Threads in a Tap with a Single-point or Single-edge Grinding Wheel

IN September MACHINERY, page 1, an article entitled "American Thread-Grinding Practice" was published which reviewed the principles applied in the development of American thread-grinding machines, and briefly compared American and European practice. The present article outlines in greater detail the methods developed in Europe, being based specifically on the practice of the German firm of Herbert Lindner, Berlin-Wittenau.

Three different methods of thread grinding are employed at the present time in European practice: (1) Grinding by means of a single-edge, axially fed wheel; (2) plunge-cut grinding by a multi-edge wheel; and (3) grinding by means of a multi-edge, axially fed conical or tapered wheel.

The method used when grinding with a single-point or single-edge wheel agrees closely with American practice. The single-edge wheel is used whenever the highest precision is required, grinding the work either from the solid or as a finishing operation. Fine pitches up to about 1/16 inch lead are always ground from the solid. Coarser pitches may be rough-ground by a multiple-edge wheel and finish-ground by a single-edge wheel, if great accuracy is required. It is possible, by the single-edge wheel grinding process, to hold the pitch diameter of the thread to an accuracy of plus or minus 0.0001 inch and to keep the accuracy of the pitch angle to plus or minus 3 minutes. Accuracy in lead can be maintained to within less than 0.0001 inch in 1 inch; to within 0.00015 inch in 4 inches; and to within 0.0003 inch in 20 inches of thread length.

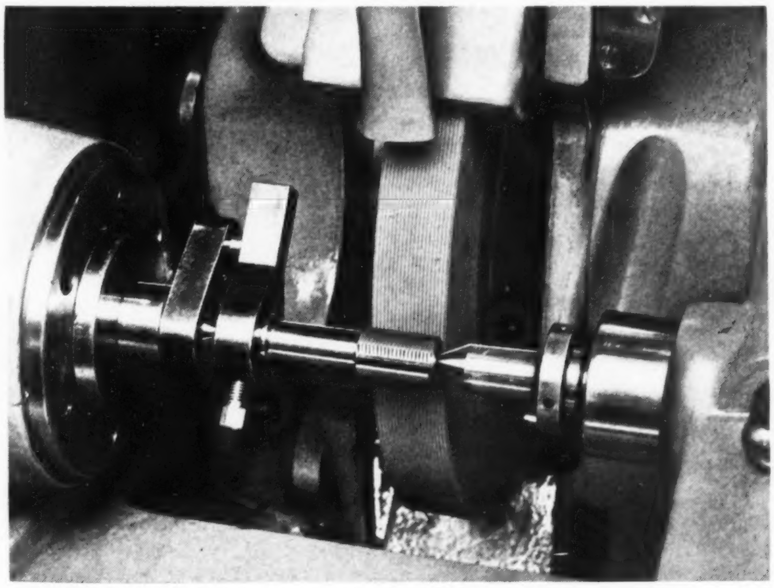


Fig. 2. Grinding the Threads on a Stud by a Plunge-cut Multi-edge Grinding Wheel

The plunge-cut grinding method with a multi-edge wheel is used for more rapid production when extreme accuracy is not required, but a good thread surface is wanted, and when the material is difficult to cut by other means. The grinding wheel may be up to 2 1/2 inches wide, being provided with annular grooves or threads for its entire width. The wheel is brought up against the work, and while the work makes a single revolution, the wheel is fed the distance of the thread lead axially along the face of the work. Most threads required to be ground for production purposes are not any longer than the width of the wheel; hence, the thread is completed by one turn of the work. Some grinding machines have provision, however, for moving the grinding wheel along the work and "catching the

thread," so that with a wheel 2 1/2 inches wide, a thread approximately 12 inches long can be ground in five successive steps.

The accuracy claimed for grinding with a multiple-edge wheel is approximately as follows: Pitch diameter, plus or minus 0.0004 inch; pitch angle, plus or minus 8 minutes; error in lead not over 0.0004 inch in 1 1/2 inches. These tolerances are sufficient for most machine parts.

The multi-edge grinding wheel is dressed by means of an oil-hardened cylindrical carbon-steel roller having annular ridges of the exact thread profile required. The roller is provided with spiral flutes, somewhat similar to those of a gear-cutting hob. It is mounted in bearings in a fixture and produces the threads on the face of the grinding wheel by being pressed against the wheel while the latter is revolving slowly. At first sight, this method of obtaining a thread profile in the grinding wheel may appear to be an unsatisfactory procedure, but the results are surprisingly good, provided the wheels used are comparatively fine-grained with a dense texture. The grinding wheel revolves at about 150 revolutions per minute, driving the roller, which is free to turn and is simply pressed against the wheel. It requires, for ordinary pitches, only from about 2 1/2 to 3 minutes to press the thread grooves into a new wheel. Redressing can be done in about one minute.

It is obvious that this method of dressing a grinding wheel by means of a roller having the proper profile can be used not only for grinding threaded parts, but also when it is desired to shape the wheel for grinding profiles of various types. Many parts can be produced economically only in this manner.

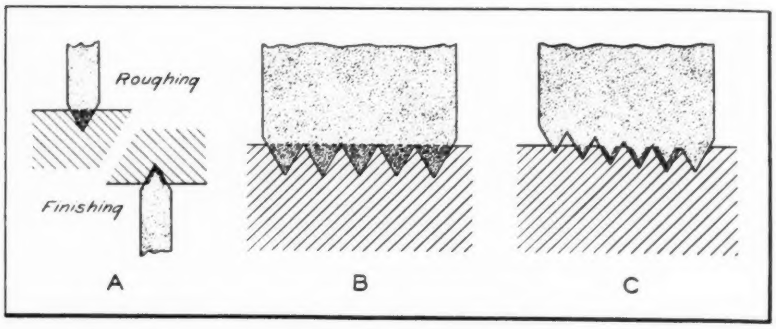


Fig. 4. Diagrams Illustrating, Respectively, the Grinding Action of (A) a Single-edge Wheel; (B) a Plunge-cut Multi-edge Wheel; and (C) an Axially Fed, Conical, Multi-edge Wheel

The third method, that of using a multi-edge tapered wheel, fed axially along the work, is used especially for grinding long threads on shafts or spindles when it would be impracticable to use several steps with the plunge-cut multi-edge wheel. The tapered grinding wheel is practically a series of single-edge grinding disks, each succeeding disk of a slightly larger diameter than the previous one, although, of course, all these "disks" are actually part of a single, solid, wide-faced wheel. Each "disk" has a comparatively light cut to take, and the method is, therefore, especially suitable for the grinding of long threads.

The tapered wheel is also employed for internal grinding. When used for that purpose, it is frequently cylindrical at one end, with the threads chamfered off at the other end in a manner somewhat similar to that used for a tap or a thread chaser. Such a wheel has been found to give the best results for internal threads when grinding from the solid, When extreme accuracy is required, the thread is finished by a single-point grinding wheel.

The accuracy obtained by the use of a tapered multi-edge wheel lies somewhere between that obtained by the use of a single-edge wheel and a plunge-cut multi-edge wheel.

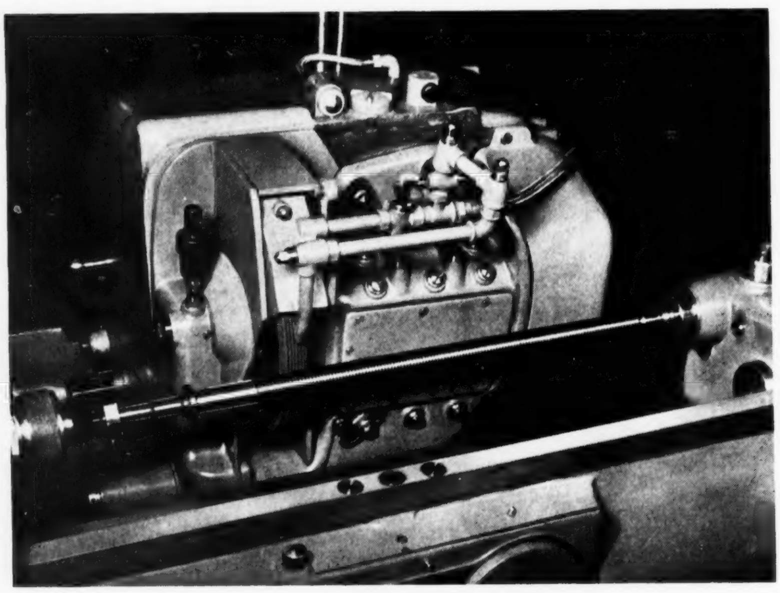


Fig. 3. Grinding a Hardened Lead-screw by Means of a Conical Multi-edge Wheel Fed in an Axial Direction

* * *

Paste for Restoring Brightness of Tarnished Nickel Parts

According to information gathered by the Glycerine Producers Association, 11 W. 42nd St., New York City, nickeled articles that have become tarnished can be restored to a bright condition by rubbing the following paste on the metal surface after it has been thoroughly cleaned: Nickel chloride, 4 ounces; precipitated chalk, 2 ounces; zinc white, 2 ounces; glycerine, 2 drams; solution of ammonia, 1/2 ounce; and water, 1 1/2 ounces.

The Heat-Treatment of Tool Steels

A Detailed Review of the Methods Used for Obtaining the Best Cutting Efficiency through the Heat-Treatment of Tool Steels—Second of Two Articles

By ROBERT C. DEALE

IN the first installment of this series of articles, published in September MACHINERY, page 33, the heat-treatment of carbon tool steel was covered in detail. The present installment will deal with the heat-treatment of high-speed steel.

All high-speed steel should be annealed after forging, and before machining, or before rehardening. Since this steel tends to harden when cooled in air, it is extremely difficult to machine bars that have not first been annealed. Successive heatings beyong the critical point tend to cause abnormal grain conditions, with accompanying structural weakness, unless the steel is thoroughly annealed after each heating.

To anneal high-speed steel, heat slowly and uniformly to a temperature of from 1600 to 1650 degrees F. and hold at this heat for two to six hours to obtain complete adjustment and uniformity of grain. Cool in the furnace or in infusorial earth, mica, lime, or any medium that will permit uniform slow cooling.

It is common practice to pack the bars or tools in annealing boxes, allowing about 1 1/2 inches between the tools and the sides of the box, lime, mica, infusorial earth, ashes, and sometimes charcoal being used as the packing material. The charcoal will give a slight casehardening effect, which may be undesirable in some cases.

Each box should be sealed with fireclay, heated slowly and uniformly to from 1550 to 1650 degrees F. in the furnace, and allowed to remain at the annealing temperature long enough to anneal the contents thoroughly. The time varies with the size of the tools and the weight of the charge, and will range between five and ten hours, although five hours should be sufficient for most conditions. Boxes and work should be allowed to cool slowly in the furnace.

Preheating High-Speed Steel

High-speed steel must be hardened at a high temperature; consequently, tools made from such steel are seldom hardened without at least one preheating stage, in which they are heated to from 1550 to 1600 degrees F. At times, when the tool to be heated is of considerable size and thickness, two or three preheats are used.

A single stage of preheating is customary when tools that are simple in form and not more than from 1 1/2 to 2 inches in thickness are being hardened. The temperature should be somewhat below the lower critical point of the steel to avoid excessive grain growth. By so limiting the temperature, the operation is not unduly sensitive, and the tool may be left in the furnace for a time sufficiently long to insure that it reaches the furnace temperature throughout.

For large, intricate tools, two stages of preheating are frequently used. The first brings the tool to approximately two-thirds or three-fourths of the temperature reached by the second stage; the second stage would heat the tool to from 1550 to 1600 degrees F., while the first stage would be at a temperature of from 1100 to 1200 degrees F.

When a single stage of preheating is used, the time a tool is left in the furnace would be as given in Table 6, provided the furnace capacity is sufficient so that the temperature is practically maintained when the tools are changed. To prevent undue chilling of the furnace, it is common practice to insert a single tool or a small lot in the hardening furnace as often as a tool is removed, rather than to insert a full charge of cold metal at one time.

Table 6. Preheating Time for High-Speed Steel with a Furnace Temperature of 1600 Degrees F.

Tool Thickness, in Inches	Time in Preheating Furnace, in Minutes
1/4	5
1/2	10
3/4	15
1	20
1 1/2	30
2	40
3	60
4	80
5	100
6	120

Preheating is usually done in a simple type of oven furnace heated by gas, electricity, or oil. Atmospheric control is seldom used, although it has some value in protecting the surface of the tool against scaling and decarburization. At the temperatures used for preheating, such protection is seldom necessary.

While lead or salt baths give good results in preheating, they are not economical because of the limited capacity of this type of equipment when the tool must remain in the bath for a considerable length of time.

Hardening of High-Speed Steel

All high-speed steels must be heated to a temperature close to their fusion point to develop their maximum efficiency as metal-cutting tools. This requires a hardening temperature ranging from 2200 to 2500 degrees F. Table 7 shows, for several of the more common high-speed steels, the effect of changes in the hardening temperature on the cutting qualities. The figures given are ratios, the value 1.00 for each steel being based on the highest observed cutting speed for that steel. The figures for different steels cannot be directly compared with each other, except to note changes in the point of maximum cutting efficiency.

Table 7. Relation of Hardening Temperature to Cutting Efficiency for Five Commonly Used High-Speed Steels

Quenching Temperature, Degrees F.	Typical Analyses of High-Speed Steels				
	18-4-1	14-4-2	18-4-1 Cobalt	14-4-2 Cobalt	Molybdenum
2200	0.86	0.83	0.84	0.85	0.95
2250	0.88	0.88	0.86	0.88	0.96
2300	0.90	0.93	0.90	0.91	0.97
2350	0.95	0.98	0.94	0.94	0.98
2400	0.99	0.98	0.98	0.98	1.00
2450	1.00	—	0.99	1.00	0.99
2500	0.98	—	1.00	0.97	0.98

The figures in the table refer to tools heated in an oven type furnace in which a neutral atmosphere is maintained. The available data indicate that a steel reaches its best cutting qualities at a temperature approximately 50 degrees F. lower than the figures in the table if it is hardened in a bath type furnace. It is, however, desirable, in any case, to use a hardening temperature approximately 50 degrees lower than that giving maximum cutting qualities, in order to avoid possibility of overheating the tool.

The data for molybdenum high-speed steel has been questioned, although it is based on the only complete study of the effect of hardening temperature on the cutting qualities of molybdenum high-speed steel tools of which the writer has any knowledge. The table indicates that such a steel should be hardened at approximately 2400 degrees F. to secure the best cutting qualities, while the manufacturers of such steel recommend a hardening temperature of from 2200 degrees F. to 2250 degrees F. It is believed that this discrepancy in the temperature values may be caused by the effect of an uncontrolled furnace atmosphere on such steels. The 2200 degrees F. temperature is very likely desirable unless a controlled atmosphere furnace is available.

The cutting efficiency of a tool is affected by the time that it is kept at the hardening temperature, almost as much as by the hardening temperature itself. It has been common practice to heat a tool for hardening until a "sweat" appeared on its surface. This sweat is presumably a melting of the oxide film on the surface of a tool heated in an oxidizing atmosphere. It does not show when the tool is heated in an inert atmosphere. This method of determining the proper heating time is at best an approximation and indicates only the temperature on the outside of the tool rather than the condition of the interior.

The only safe method is to heat the tool for a definite predetermined time, based on the size and the thickness of metal which the heat must penetrate to reach the interior. The values given in Table 8 are based on a series of experiments to determine the relative cutting efficiency of a group of tools hardened in an identical manner, except for variations in the time the tools were kept at the hardening temperature. The time given is based on that required to harden throughout a tool resting on a conducting hearth; the tool receives heat freely from three sides, on its large top surface and its smaller side surfaces. The table does not apply to a disk lying flat on the earth. In the case of a tool having a projecting cutting edge, such as a tap, the thickness or depth of the projecting portion on which the cutting edge is formed should be used in referring to the table.

In many cases, it will be found impracticable to use both the temperature for maximum cutting efficiency given in Table 7 and the heating time given in Table 8, because the equipment available will cause abnormal scaling, grain growth, and surface decarburization of the tool if this combination is used. The principal value of an accurate control of the furnace atmosphere appears to lie in the fact that its use makes possible the particular heat-treatment that produces the best molecular structure in the tool without destruction of the tool surface or grain.

Table 8. Time that High-Speed Steel Tools Should be Kept in High-Heat Furnace for Hardening Throughout

Tool Thickness, in Inches	Time in Furnace at High Heat, in Minutes	Tool Thickness, in Inches	Time in Furnace at High Heat, in Minutes
1/4	2	3	12
1/2	3	4	15
3/4	4	5	18
1	5	6	20
1 1/2	7	8	25
2	8	10	30

The time periods given in Table 8 are based on complete penetration of the hardening. It is obvious that it is impracticable to use time periods as long as those required for the greater thicknesses. For very thick tools, the practical procedure is to harden to a depth sufficient to produce an adequate cutting edge, leaving the interior of the tool relatively soft.

There appear to be two types of hardness in a high-speed steel tool. One is a hardness caused by the particles of complex carbides scattered in crystalline form throughout the tool, much as the abrasive particles are distributed throughout a

grinding wheel. This hardness, which affects the ability of the tool to take heavy roughing cuts, seems to be retained after a slow quench much better than the other type of hardness, which affects the resistance of a tool to abrasion, and which is apparently caused by the hardness of the tool matrix. This hardness appears to be affected by the extent to which the carbides are dissolved in the relatively soft material which binds the large crystals of complex carbides together, as the bond of a grinding wheel holds together the particles of abrasive material.

Oven type furnaces are generally used for heating high-speed steel tools for hardening, since the high temperatures required cause considerable difficulty when a bath type furnace is used. At the high temperatures necessary, lead baths are impracticable, because of the rapid oxidation of the lead. Salt baths are in use to some extent because of their desirable heating characteristics. They provide protection against the atmosphere during the heating period, while the film of salt left on the tool after withdrawal from the bath protects its surface until it is quenched.

It is desirable to use both automatic temperature control and controlled furnace atmosphere when hardening high-speed steel, because of the variations in cutting qualities caused by hardening under uncontrolled conditions.

Quenching High-Speed Steel

High-speed steel is usually quenched in oil. The oil bath offers a convenient quench; it calls for no unusual care in handling and brings about a uniform and satisfactory rate of cooling, which does not vary appreciably with the temperature of the oil. The quenching bath is used at room temperature, and requires no accessory treatment, machinery, or handling as is the case with compressed air, lead, and salts.

Some authorities believe it desirable to withdraw the tool from the oil bath for a few seconds after it has reached a dull red. It is believed that it is desirable to move the tool around in the quenching oil, particularly immediately after it has been placed in it, to prevent the formation of a gas film on the tool. Such a film is usually a poor conductor of heat and slows up the rate of cooling.

Quenching in a lead or salt bath at from 900 to 1100 degrees F. has the advantage that cooling of the tool from hardening to room temperature is accomplished in two stages, thus reducing the possibility of setting up internal strains which may tend to crack the tool. The quenching temperature is sufficiently below the lower critical point for a tool so quenched to be allowed to cool to room temperature in still air. This type of quench is particularly advantageous for tools of complicated section which would easily develop hardening cracks.

The salt quench has the advantage that the tool sinks and requires only a support, while the same tool will float in the lead bath and must be held under the surface. It is believed that the lead quench gives a somewhat higher matrix hardness, and is of advantage for tools that tend to fail by nose abrasion.

Tools treated as described are brittle unless given a regular tempering treatment, as the 1100-degree F. quenching temperature is not a substitute for later tempering at the same temperature, after the tool has cooled to room temperature.

Many high-speed steel tools are quenched in air, either in a stream of dry compressed air or in still air. Small sections harden satisfactorily in still air, but heavier sections should be subjected to air under pressure. One advantage of air cooling is that the tool can be kept straight and free from distortion, although it is likely that there will be more scale on a tool thus quenched than when oil, lead, or salt is used. Thin flat tools, which must be kept straight and flat, can be cooled advantageously between steel plates.

Straightening Tools When Quenching

The final straightness required in a tool must be considered when it is quenched. When a number of similar tools are to be hardened, a jig can be used to advantage for holding the tools while quenching.

When long slender tools are quenched without holders, they frequently warp and must be straightened later. The best time for this straightening is during the first few minutes after the tools have been quenched, as the steel is then quite pliable and may be bent without difficulty. The straightening must be done at once, as the tools become hard in a few minutes.

Tempering High-Speed Steel

The secondary heat-treatment of high-speed steel, usually called tempering, although the metallurgical effect differs from that resulting from the tempering of carbon tool steel, was discovered and described by Taylor. This treatment both toughens the steel and increases the cutting speeds that can be used.

Table 9 shows the effect of variations in tempering temperature on the torsion impact and

Table 9. Relative Strength of 18-4-1 High-Speed Steel as Affected by Variations in the Tempering Temperature. Steel is Oil-Quenched from 2400 Degrees F.

Tempering Temperature, Degrees F.	Relative Strength		Rockwell Hardness Number C Scale
	Torsion Impact	Bending	
0	0.24	0.15	64
400	0.54	0.74	62
600	0.78	0.83	59
800	0.85	0.81	61
900	1.00	0.78	62
1000	0.78	0.89	62
1100	0.42	1.00	63
1200	0.38	0.86	58

Table 10. Relative Cutting Efficiency and Rockwell Hardness of Various High-Speed Steels as Affected by Variations in the Tempering Temperatures

Tempering Temperature, Degrees F.	18-4-1 Steel, Oil-Quenched from 2400 Degrees F.		14-4-2 Steel, Oil-Quenched from 2350 Degrees F.		18-4-1 + 4% Cobalt Steel, Oil-Quenched from 2450 Degrees F.		14-4-2 + 4% Cobalt Steel, Oil-Quenched from 2400 Degrees F.	
	Cutting Efficiency	Rockwell Hardness C Scale	Cutting Efficiency	Rockwell Hardness C Scale	Cutting Efficiency	Rockwell Hardness C Scale	Cutting Efficiency	Rockwell Hardness C Scale
0	0.97	64	....	65	0.96	..	....	64
400	0.98	62	0.97	62	0.97	..	0.97	62
600	0.99	59	0.99	61	1.00	..	0.97	59
800	0.99	61	0.99	62	0.99	..	0.97	61
900	0.99	62	0.99	62	0.99	..	0.97	62
1000	0.99	62	0.99	62	0.99	66	0.98	62
1100	1.00	63	1.00	63	1.00	65	1.00	62
1200	....	58	....	57	....	62	....	57

bending strength, and the Rockwell C hardness at 70 degrees F. of the commonly used 18-4-1 steel, while Table 10 shows the effect of variations in tempering temperature on the cutting efficiency and hardness at room temperature of several high-speed steels.

It will be seen that high-speed steels generally reach their maximum efficiency as cutting tools when tempered at 1100 degrees F., while the maximum bending strength of the 18-4-1 steel is obtained at the same temperature. For this reason, it is common practice to temper all high-speed steel tools at from 1050 to 1100 degrees F., although a temperature of 900 degrees F. would appear advantageous for tools subjected to much shock.

The torsion impact strength of 18-4-1 high-speed steel tools tempered to secure maximum strength is seen to be about four times that of the untempered steel, while, when tempered to secure maximum cutting efficiency, its strength is approximately twice that of untempered steel. At this same point, its bending strength is nearly seven times that of the untempered steel.

High-speed steel tools for general use should be kept at a tempering temperature of from 1050 to 1100 degrees F. for a period of at least 60 minutes after they have reached furnace temperature, although from 15 to 30 minutes will be sufficient to relieve the greater part of the internal stress. When possible, however, a tempering time of 120 minutes is desirable to produce both maximum toughness and maximum cutting efficiency.

Oven type furnaces heated by gas, electricity, or oil are commonly used for the tempering of high-speed steel tools. As the temperatures used are below the critical temperatures, there is little danger of grain growth. Because of the length of the treatment, it may be desirable to provide atmospheric control for electric furnaces to prevent scaling of the tool surface. A well designed gas- or oil-fired furnace can be operated at the required temperatures with a smoky atmosphere, which will have little tendency to cause scale formation.

Lead and salt baths give desirable results for tempering high-speed steel tools, but are not usually adapted to the handling of many tools at one time, and the length of the tempering process also makes their use undesirable in most cases. They are, however, used for tools that cannot be ground after hardening, so that scaling of the surface must be avoided.

Tool strength drops rapidly when hardening temperatures higher than 2400 degrees F. are employed. An 18-4-1 steel containing 4 per cent cobalt reaches its maximum cutting efficiency when hardened at 2500 degrees F., but is found to have only 42 per cent of the strength of the same steel hardened at 2350 degrees F., when measured by the bending test. Many tools are hardened purposely at temperatures below those that give maximum cutting efficiency in order to gain an increase in strength. This is particularly true of tools used under conditions where they are likely to be subjected to abuse.

"Flaky" Tool Fractures

A high-speed steel that has been subjected to repeated forging or hardening operations frequently develops a coarse crystalline fracture, in contrast to the usual silky appearance. The flakiness increases with the hardening temperature and the number of quenchings. The endurance of high-speed steel having a flaky structure is, in general, about the same as that of the same steel with a normal structure, except that it is more brittle and is likely to give erratic results.

Flaky structure in high-speed steel cannot be entirely eliminated by any simple heat-treatment. A reduction in cross-sectional area, preceded and followed by a 1600-degree annealing treatment, is the most effective method. The condition can be prevented by giving the steel a thorough annealing between quenchings.

Dimensional Changes During Heat-Treatment

Dimensional changes in high-speed steel during heat-treatment vary both in direction and amount with the treatment of the steel during hardening and with the previous treatments given the steel at the steel mill and in the manufacture of the tool. In general, the changes increase in amount both with the hardening temperature and with the time the tool remains at that temperature. The changes may range from 0.03 to 0.2 per cent, and

must be taken into consideration when making tools that must maintain their contour and that are not ground after hardening.

The dimensional changes are more definite, both in direction and amount, when the tools are annealed after rough-machining. They can be minimized by a rigid control of the hardening temperature and of the period of heat-treatment. By annealing before hardening, all strains set up in the rolling and forging of the steel can be eliminated. Both the hardening temperature and the time the tool is kept at this temperature should be as low as practicable to keep dimensional changes at a minimum for tools that are not ground after hardening. It is believed that quenching the tool in a salt or lead bath at a temperature of from 900 to 1100 degrees F. will reduce the amount of the dimensional changes.

Tempering up to 900 or 1000 degrees F. after hardening will reduce the original expansion or increase the shrinkage, but the final dimensions will seldom be those of the original piece before hardening. Unfortunately, there are few data by which the effect of variations in heat-treating methods on the dimensions of a tool can be predicted.

* * *

Saving $2400 in Rebuilding Dies

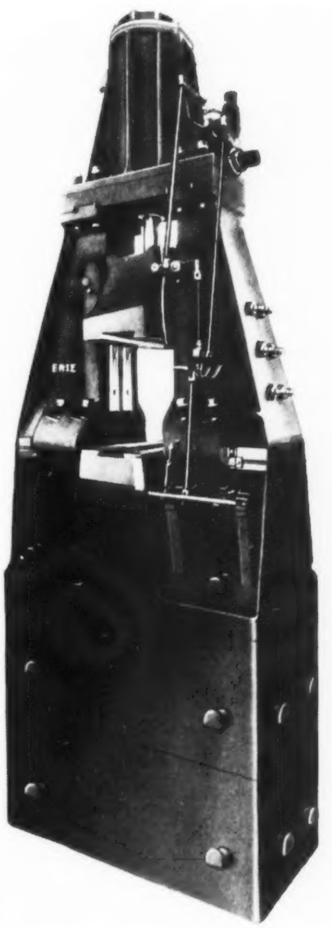
A midwest manufacturer was recently confronted with the necessity of either making two new dies for an improved design or of changing the original dies. New dies would cost $2800 and would require eight weeks to make; but the old dies could be rebuilt in three weeks for only $400—a saving of $2400.

The rebuilding was done by the aid of a General Electric atomic hydrogen arc-welder. The cost of rebuilding the dies included annealing the dies for welding, the welding operation, machining and normalizing to remove strains, recarburization to harden the metal, and polishing. By the use of atomic hydrogen welding, metal of the same carbon content and analysis as that of the die material could be added; and the hydrogen atmosphere prevented the formation of impurities during welding. The built-up area had the same grain structure and hardness as the rest of the die.

Largest Steam Drop-Hammer in the United States

What is said to be the largest steam hammer in the United States and the second largest hammer in the world has recently been completed by the Erie Foundry Co., Erie, Pa., the company that also built the only existing larger hammer, which was shipped to Europe. This hammer was described in January, 1939, MACHINERY, page 353.

This machine, just completed for installation in a midwestern city, is rated as a 35,000-pound hammer. The actual weight of the ram, rod, and piston is about 42,000 pounds. In addition, there is a top die weighing 10,000 pounds. The total weight of the machine is 440 tons. The top section of the anvil weighs 130 tons, and each of the bottom sections 110 tons.



Largest Steam Drop-hammer Installed in the United States, Built by the Erie Foundry Company

The over-all height of this machine is 40 feet 6 inches; of this, 23 feet 6 inches will be above the floor line when the machine is installed. It will rest on a timber mat 3 feet thick, supported by a concrete foundation block weighing about 350 tons. Below this, there is an isolating layer of cork, and then a reinforced concrete footing distributing the load on the soil. The construction of the foundation required an excavation 36 feet deep. This excavation was of such size that it could easily accommodate a three-story house.

In this machine, dies up to 44 inches wide can be used, supported without overhang front and back, up to a length of 90 inches. Since dies longer than this will be regularly used in the hammer, a special construction is employed to prevent angular misalignment of long dies. The hammer will be used for forging light metal alloys. The building of this and other gigantic hammers now under construction has necessitated the installation of huge machine tools in the Erie Foundry Co.'s shops, to handle the enormous castings.

* * *

According to the New York State Chamber of Commerce, strikes in the United States have more than doubled in the last three years, compared with the three years prior to the Wagner Act.

Ideas for the Shop and Drafting-Room

Time- and Labor-Saving Devices and Methods that Have been Found Useful by Men Engaged in Machine Design and Shop Work

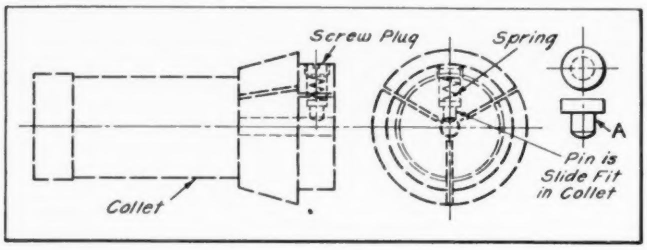


Diagram Showing Collet Equipped with Spring Pin

Spring Pin for Holding Scrap Stock in Screw Machine Collet

When parts are produced from rod stock in an automatic screw machine, trouble is sometimes experienced from the short scrap ends slipping back into the collet. This occurs when the feed-fingers pull off the short piece, leaving it free to vibrate into the collet before the machine can be attended to by the operator. Removing the piece results in lost time and delayed production.

To overcome this difficulty, a spring pin can be inserted in the nose of the collet, as shown in the illustration. This pin prevents the stock end or scrap from slipping back into the chuck, thus permitting it to be easily removed before placing a new bar of stock in the machine.

The spring pin is shown to an enlarged scale at *A*. The pin is turned from drill rod stock and hardened. The wearing qualities of the pin are improved by chrome-plating and polishing.

Groton, N. Y. A. C. ZEAMER

Self-Contained Packing for Hold-Down Clamp

On page 415 of February MACHINERY is shown a stepped clamp packing designed to prevent the packing and clamping bolt from becoming separated. This packing, however, loses its effectiveness when the lower steps are used, the clamping bolt then transmitting more pressure on the packing than on the work. To permit the clamping bolt to be located in its proper position close to the work when the lowest step on the packing is used, it would be necessary to provide a slot for the clamping bolt instead of a hole. This, however, would separate the two parts, thus eliminating the self-contained feature.

A method of holding clamps and packing in place when clamping work to the faceplate of a lathe consists of placing a fairly strong coil spring on each of the clamping bolts. With this arrangement, the packing should be slightly higher than the work.

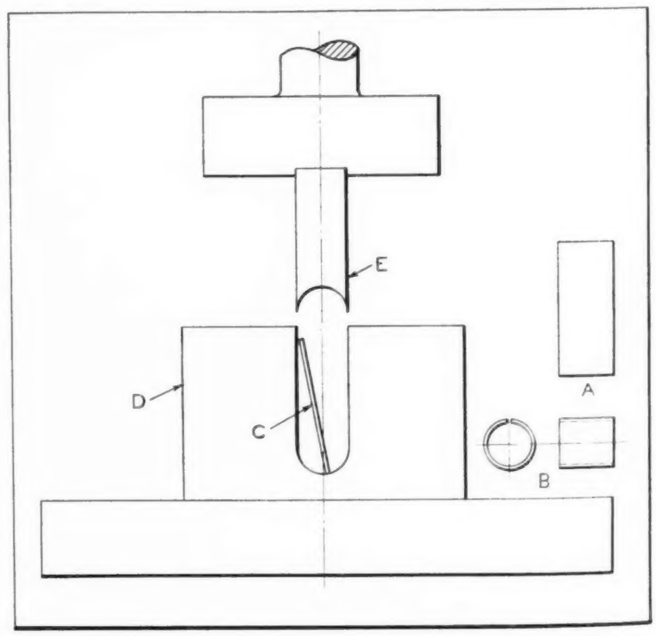
Oakland, Calif. M. JACKER

Forming Spacing Tubes from Flat Blanks

Cylindrical metal tubes, such as are used for spacers in assembling various products or for any purpose where a tube with a seam is not objectionable, can be produced economically from flat stock on a die of the type illustrated. Tubes like the one shown at *B* for use as spacing fillers in the bases of novelty lamps are made in ten different lengths cn the die shown. The flat blank *A* is formed into a tube such as shown at *B* in one operation on a foot-actuated press. The blanks are cut to the required length from 24-gage soft steel, 1 15/32 inches in width.

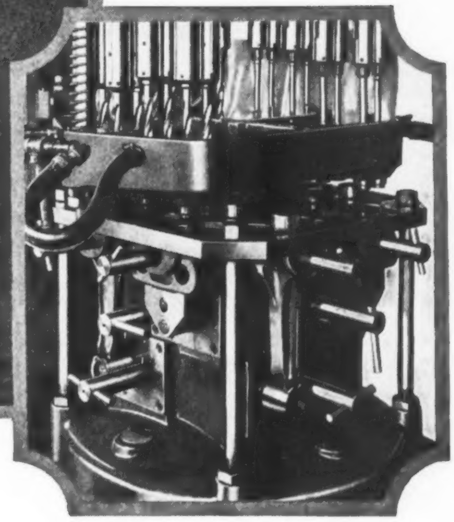
The flat blank is inserted in the die, as shown at *C*. The punch *E* is a close fit in the die *D*. Downward pressure of the punch curls or forms the blank into a tube 1/2 inch in diameter. Insertion of the succeeding blank serves to eject the finished piece. Three or four blanks for the shorter tubes are formed in one operation.

New York City M. J. GOLDSTEIN



Die for Forming Flat Metal Blank A into a Tube Such as Shown at B

Design of Tools and Fixtures



Grinding Spherical Shapes in a Lathe

By JOHN W. GERDEL, St. Louis, Mo.

The accompanying illustration (Fig. 5) shows a device for grinding the spherical end of cores to be used in permanent molds for aluminum castings. The pieces were first machined as shown in Fig. 4. After the hardening process, they were ground on the body and the tapering point by a cylindrical grinder. A ring gage, such as shown in Fig. 1, was made for gaging the tapered end of the work, the tapered hole in the gage being ground to a diameter of exactly 0.378 inch at the small end. The taper on the work was ground to fit this gage, stock being removed until the distance *J*, Fig. 3, between the shoulder and the gage was correct; then a line *H* was scribed on the work at the small end of the gage. As the shape and dimension of the spherical end of the work had to be exact, the grinding device shown in Fig. 5 was used.

The piece *C* was fitted into the toolpost slide of the lathe and held in place by two set-screws. A supporting arm *D* was slotted at the outer end to receive the clamping post of the toolpost grinder.

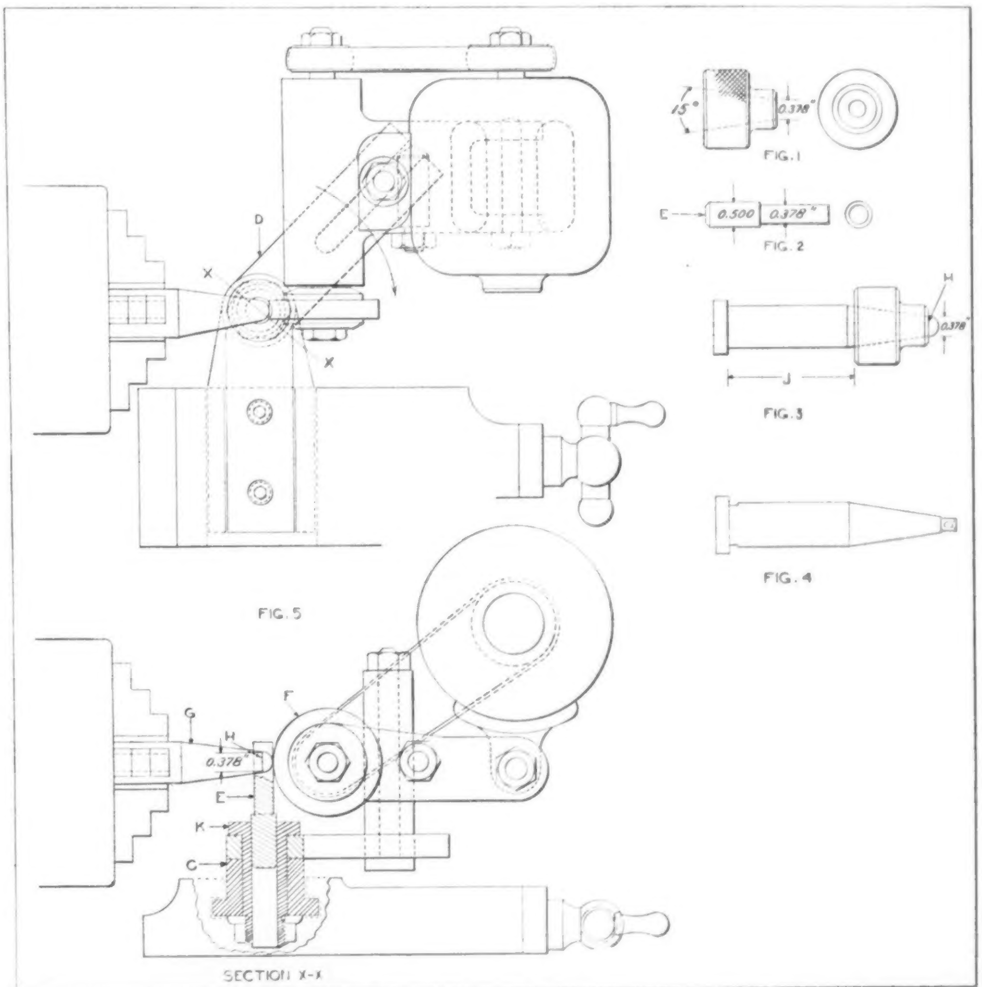


Fig. 1. Gage Used in Grinding Spherical End on Tapered Piece G, Fig. 5. Fig. 2. Plug for Setting Grinding Wheel. Fig. 3. Gage Shown in Position on Tapered Piece. Fig. 4. Rough-machined and Hardened Piece. Fig. 5. Set-up for Grinding Spherical End on Tapered Piece

A bushing *K* was bored to fit the shouldered pin *E* and was threaded at the end for a nut.

The pin *E*, which is used in setting the grinding wheel in the correct position, was made as shown in Fig. 2. One end of the pin was placed in bushing *K* and the other end was turned to 0.378 inch, which is the size of the spherical surface to be ground on the work. Next the grinding wheel *F* was trued up and adjusted until it just touched the pin *E*. The pin was then removed and the wheel brought in line with the tapered end of the work *G*. Later a plug was made with a 0.200-inch pin. After the wheel is trued up and placed in position, size blocks are used to obtain the diameter required by placing them between the pin and the wheel. This eliminates the necessity of making a separate pin or plug for each size.

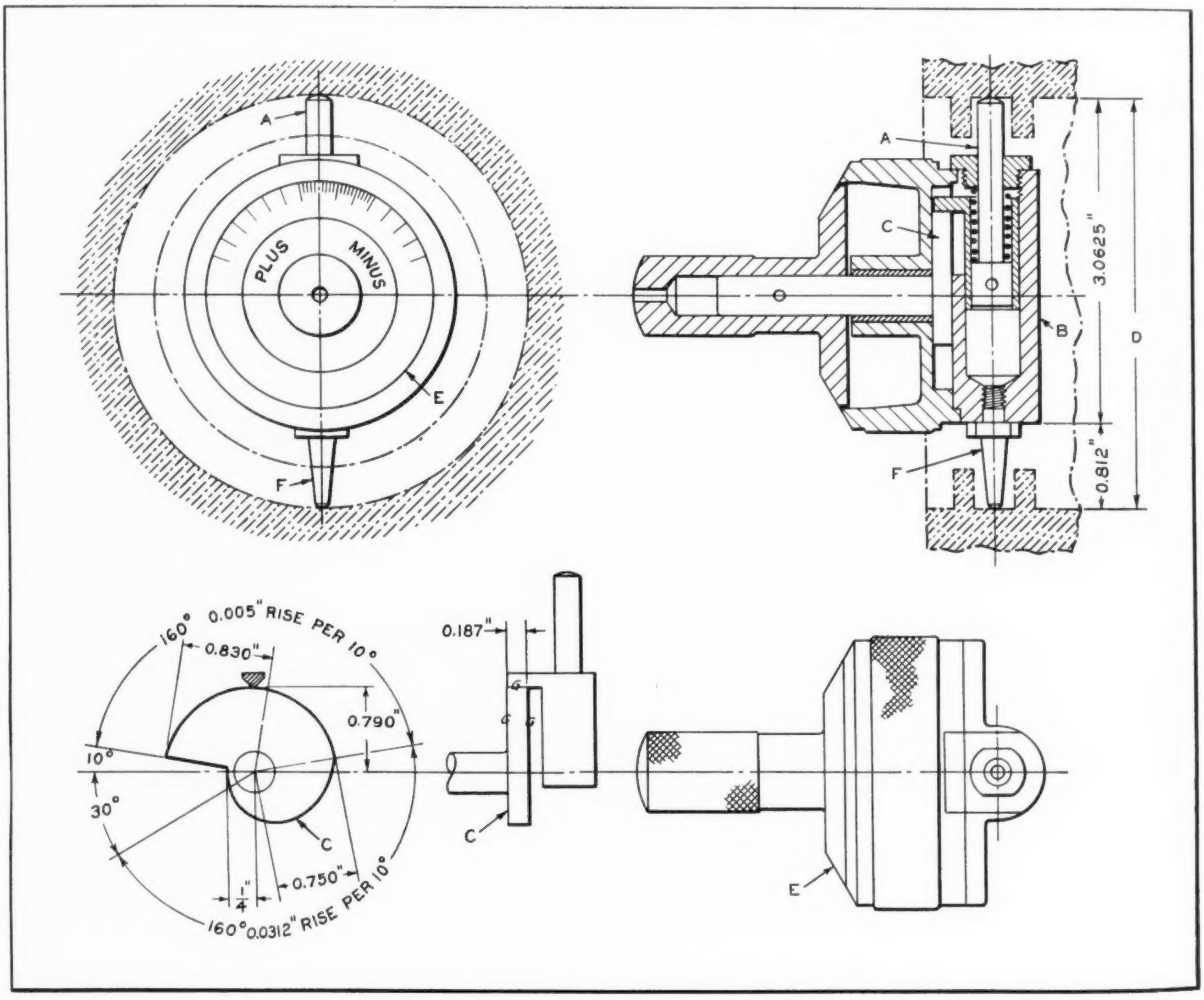
The work was trued up in a four-jaw chuck, and an indicator was used at the scribed line *H* on the taper. The grinder was moved as shown by the arrow in the top view of Fig. 5. The grinding wheel was fed to the work by means of the screw in the compound slide until the spherically ground surface reached the scribed line *H*.

Micrometer Groove Gage

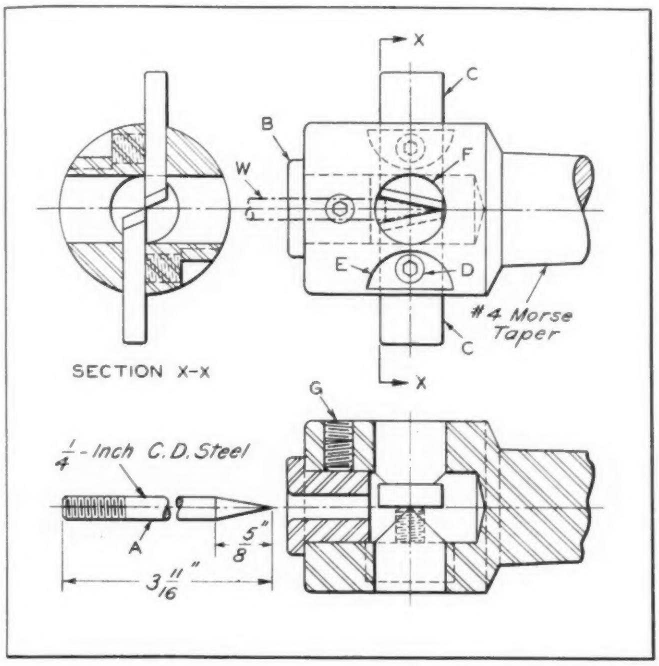
By ERIC A. REIBIG, Green Bay, Wis.

The illustration shows a gage developed for measuring the diameter of grooves machined in bores or holes for oil-seal retainers. This gage has a collapsing measuring member *A* that permits the measuring points to be inserted in the grooves and removed after gaging the diameter *D*.

The plunger *A*, located in the measuring head *B*, is controlled by cam *C*. The cam is so shaped that the plunger is brought quickly to the measuring position by turning the dial *E* attached to the camshaft. The measuring area of the cam is so designed that uniform rotation of the cam transmits a constant rising motion to the plunger. The diagram in the lower left-hand corner of the illustration shows that a cam rotation of 2 degrees causes the plunger to rise 0.001 inch. The face dial *E* indicates the rise of the plunger in terms of 0.001 inch. A measuring point *F* of suitable length for gaging the bore is screwed into a tapped hole in the measuring head *B*.



Micrometer Gage for Measuring Diameter of Grooves Machined in Bores



Box-tool for Machining Point on Piece A

Box-Tool Fixture for Machining Conical Point

By R. A. DRESSLER, Millersburg, Pa.

In the accompanying illustration is shown a box-tool fixture for machining the conical point on the piece *A*, which is produced in lots of 10,000 and 12,000. The points machined on these pieces must be needle sharp. The box type pointing tool of the design shown in the illustration can be used in either the tailstock spindle of an engine lathe or in the turret head of a screw machine, as desired.

The dot-and-dash lines at *W* show the piece *A* passed through the guide bushing *B*, which is held in the tool by a set-screw at *G*. This bushing supports the work close to the two high-speed tools *C* and is interchangeable with similar bushings for pointing rods of various sizes. The tools *C* are 11/16 inch wide by 1/4 inch thick, and are fitted into slots broached in each side of the cylindrical tool-head. The two set-screws *D*, let into the end-milled recesses *E*, hold the tools in place. The cross-hole *F* drilled through the tool-head provides an outlet for chips, permits the cutting fluid to reach the tools, and also gives the operator a clear view of the tools. With a good flow of cutting fluid, it is possible to point four pieces a minute with a box-tool of the design described.

Dies for Producing Tapered Tubes from Sheet Brass

By M. J. GOLDSTEIN, New York City

Tapered tubes for use as spouts on oil-cans, watering cans, etc., are blanked and formed from 20-gage sheet brass to the shape shown at the bottom of Fig. 1. These tubes are 7 3/4 inches long, and have an outside diameter of 1/4 inch at the small end and 11/16 inch at the large end.

The blanking die, shown in Fig. 3, is made in sections, as indicated. The two guide strips *K* and *L* serve to locate the sheet stock, which is 8 inches wide and 0.032 inch thick. The two tapered sides of the blanking punch are filed to a radius of 3/8 inch to form or curl the edges of the blank, as may be seen in the third view from the bottom in Fig. 1. This radius-forming of the blank helps to give a smooth, accurately rounded tube. The sheet material is turned end for end after each blanking, so that the scrap appears as shown in the top view of Fig. 1. This method of spacing results in a minimum of waste material.

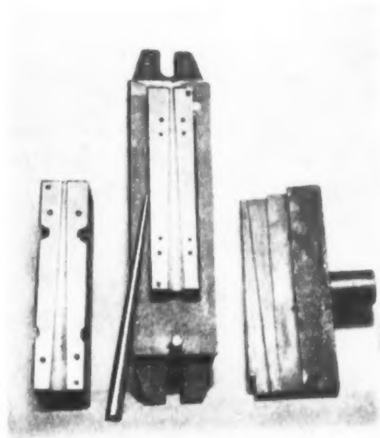


Fig. 2. Die with Two Punch Members for Use as Shown in Figs. 4 and 5

One die, as shown in the central view of Fig. 2, is used for the two forming operations, two punches being used with the same die. The punch for the first forming operation is shown in Fig. 4, with the die set up for the U-shaping operation. Two strips *Y* are used to hold the locating pieces for the blank and to give the die additional depth. After being formed to the U-shape, the blank is slipped from the punch member. The work thus formed is shown in the second view from the bottom in Fig. 1.

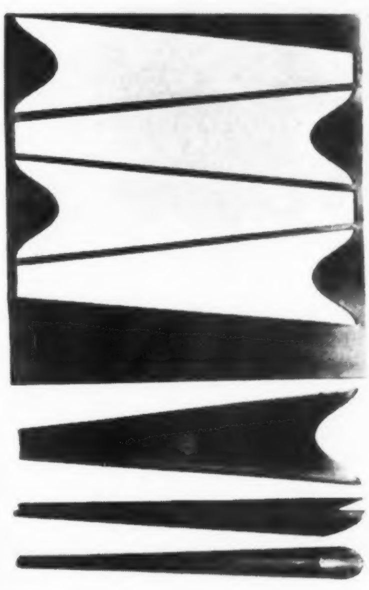
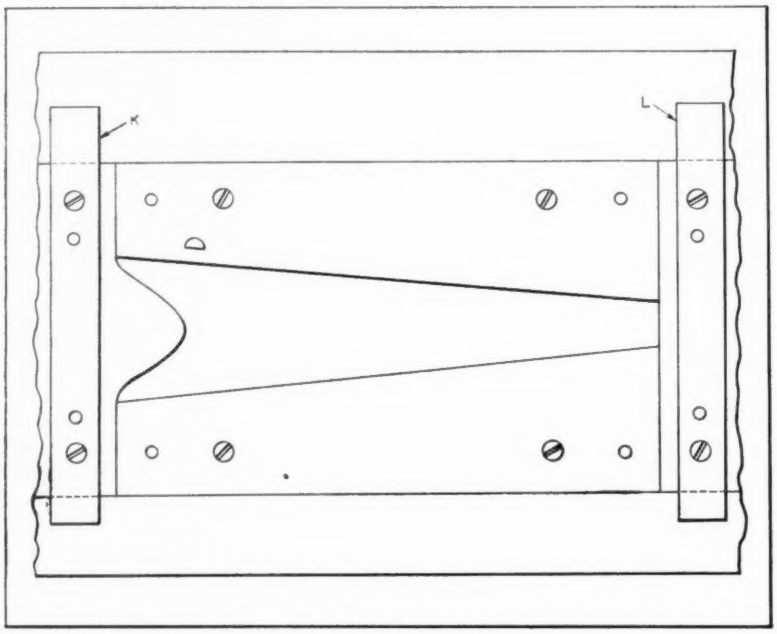
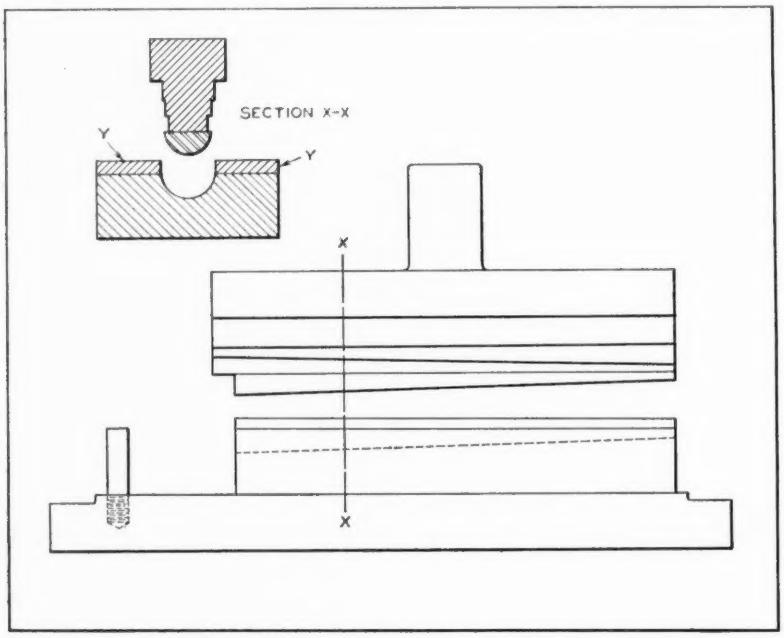


Fig. 1. Scrap Stock, Blank, U-formed Blank, and Finish-formed Tapered Spout

Fig. 5 shows the die as used for closing the tubing, so that the edges of the material form a tight seam that can be easily soldered. The forming mandrel *F* is shown in position between the punch *G* and the die *H*.





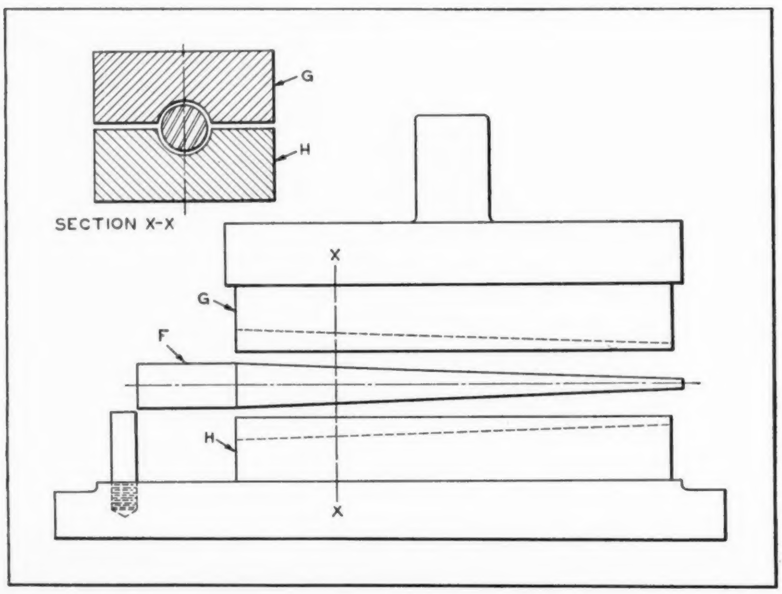


Fig. 3. (Top) Die Used to Produce Blank for Tapered Spout

Fig. 4. (Center) Die Arranged for the U-forming Operation

Fig. 5. (Bottom) Die and Mandrel Used for Final Forming of Tapered Spout

When the die is in use, the mandrel is inserted in the blank formed in the first closing or U-forming operation. The mandrel and work are then placed in the die. The punch used in this case is a duplicate of the die, so that when it closes on the die the work is formed to the required shape.

In making the forming die shown in Fig. 5, the two parts *G* and *H* were doweled and set up in the lathe for drilling between centers. The sizes of the drills used varied, being progressively larger for the larger end of the die. A tapered "half-reamer," taper-turned between centers, was used for finishing the tapered recesses in members *G* and *H*. Mandrel *F* was taper-turned to the size required for the inside of the work.

* * *

Census of Manufactures for 1939

The Bureau of the Census, Washington, D. C., will shortly send to manufacturers questionnaires or schedules relating to production in 1939. Mr. Fitzgerald, chief statistician for manufactures, emphasizes that the important enterprise of obtaining a complete statistical record of manufacturing in the United States requires the wholehearted support and cooperation of manufacturers, trade associations, trade publications, and chambers of commerce. In order to make the statistics available at as early a date as possible, it is of prime importance that manufacturers report promptly. The census should not only be complete and accurate, but will have additional value if the statistics can be compiled at an early date.

* * *

The greatest single force in the material development of American life is now, and always has been, business.
—*New York World-Telegram*

Increasing the Life of Cutting Tools by an Improved Method of Grinding

A Review of the Factors Affecting Cutting Tool Efficiency and a Description of a New Method of Grinding the Different Types of Tools to Improve Cutting Capacity and Increase Life

By LEO J. ST. CLAIR, President
General Tool & Die Corporation, East Orange, N. J.

A NEW method of grinding all types of cutting tools has been developed that eliminates the burning and checking of high-speed steel and Stellite tools, and the checking or cracking of carbide tools. The new method applies to hand grinding and includes the safe grinding and polishing of high-speed and Stellite tools and safe grinding and diamond-lapping of cemented-carbide tools.

The need for a new and safer method of grinding cutting tools has been apparent for a long time. Present methods of hand grinding often result in inefficient and variable cutting tool performance, and the methods of machine grinding may also greatly affect the performance of the tool.

The following three conditions must be considered if the tool life and performance of cutting tools are to be improved:

1. There is a wide variation in clearance and rake angles of cutting tools used for the same work, because the bar rest type of hand grinder does not make it possible to grind all cutting tools at definitely known angles. More than thirty years ago, Frederick Taylor proved conclusively that a wide variation in tool life results from a variation in clearance and rake angles.

2. A great many cutting tools are partially ruined while grinding on wheels that operate at speeds that make it easy for the operator to burn or check the tool. This is true of both hand grinders and machine grinders and accounts for the poor performance of many cutting tools.

3. Most machine shops use rough-ground or semi-finished cutting tools. These give only about 50 per cent of the tool life possible on many cutting applications. Polishing or lapping should be used to secure substantial increases in tool life. There are a few types of cutting tools that have proved beyond the shadow of doubt the great value of polished surfaces in increasing tool life. The polished-flute drill, the polished-flute tap, and the polished gear-cutter are examples. In addition, many parts subjected to wear are now being "superfinished" to increase their life.

The frequent neglect of cutting tools has always puzzled the author. In modern shops, we find a large investment in machine tool equipment and a well paid personnel whose job it is to see that these machine tools operate at their best efficiency and produce the highest rate of return possible. Yet the cutting tool, which is so important in securing the best return from this large machine tool investment, is not given anywhere nearly the required consideration. The efficiency of the cutting tool largely determines the productivity of the machine tool and should, therefore, be given equal thought.

New Method of Grinding and Polishing High-Speed Steel and Stellite Tools

The new method of grinding and polishing high-speed steel and Stellite tools involves:

1. The maintenance of proper clearance and rake angles through quadrant control.

2. The rough-grinding of the tools in such a way as to eliminate burning or checking.

3. The polishing of the clearance and top rake angles, so as to eliminate the coarse cutting edge produced by the grinding wheel and the rough surface on the top face of the cutting tool which causes excessive frictional heat as the flowing chip slides over this face.

Each of these factors will now be discussed in detail.

The Maintenance of Clearance and Rake Angles

As already mentioned, when high-speed steel and Stellite cutting tools are ground on a bar rest type of grinder, there is a great variation in clearance angles, since few men can grind a correct angle without a protractor. About twelve years ago, the writer carried out several tests to find out how closely a number of machinists could grind a 6-degree clearance angle on a conventional bar rest

grinder. The grinding was done by thirty good machinists, each being instructed to grind a 6-degree clearance angle on a 1/2-inch square tool bit.

The results showed a variation of from 3 to 21 degrees; yet all of these men intended to grind, and thought that they had approximately ground, a 6-degree clearance angle on the tool. They were asked how much a 6-degree angle would "open up" in 1/2 inch, but none of them knew. These tests certainly indicated that it is not reasonable to expect even good machinists to maintain proper clearance angles with the usual type of hand grinding.

There are large losses in production due to these varying clearance angles; often the tool life is decreased as much as 50 per cent. Variations in the top side rake or slope will also greatly affect the tool life; hence, it is important that means be provided for controlling the cutting angles. For this purpose, a hand grinder should be equipped with tables that tilt and can be set at definite angles by means of a quadrant. In that way, angles on tools can be ground to a specified number of degrees, and the angles can be duplicated time after time. By avoiding the variation in clearance and rake angles, the average tool life of cutting tools is easily increased 20 per cent—often more.

Rough-Grinding of High-Speed Steel and Stellite Tools

High-speed steel and Stellite tools should be rough-ground in such a way as to prevent injury from excessive grinding heat. Many of these tools are overheated in grinding, injuring the tools and resulting in poor tool performance. The sudden overheating of the cutting tool by the grinding wheel causes a rapid expansion of the tool material next to the grinding wheel, while the material immediately back of the overheated section is still cool and not expanded. The difference in expansion causes the tool material to check or crack. This, in turn, reduces the tool life. Moreover, the hardness of the cutting edge is often decreased by this sudden localized overheating. This softening of the material obviously reduces the wear-resisting properties of the cutting edge and thus decreases the tool life.

One often sees an operator dipping the cutting tool in water during the grinding operation. Overheating of a tool while being ground causes the shank to feel uncomfortably warm to the hand, and, hence, the tool is dipped in water to cool it off. This repeated sudden cooling is very harmful to most cutting tools, since it has a tendency to check or crack the tool.

In order to prevent injury to cutting tools due to overheating while grinding, tools should be rough- and finish-ground in such a way that there is no possibility of overheating. High grinding wheel speeds and too hard wheels are the two principal causes of overheating. Grinding wheels on both hand and machine grinders are usually run at 5000 feet per minute, sometimes more. This high speed obviously causes excessive heat.

The author has experimented with wheel speeds and hardnesses to find the combination that would be least likely to injure high-speed steel or Stellite while grinding. The problem was approached from the standpoint of a machinist who is not an expert grinder and who, as a rule, does not realize the possible harm that can be done to cutting tools in grinding.

It was found that grinding wheel speeds of from 1600 to 2600 feet per minute did not noticeably increase the time required for grinding cutting tools. Such low grinding wheel speeds decreased the heat produced during grinding to a marked degree; in fact, it was difficult to produce enough heat to injure the tool. Low grinding wheel speeds, therefore, were considered the chief protection to the cutting tool during the grinding operation.

It was also found that the hardness of the grinding wheel was important in reducing the heat produced. Grinding wheels with a hardness similar to K (Norton) or P (Carborundum) were found safe to use. Of course, grinding wheel wear is greater with the softer wheels than with the harder ones; but it is false economy to save on grinding wheel costs by using hard wheels which injure the cutting tools by overheating. The injured cutting tools cause losses that are many times greater than the added grinding wheel costs due to the use of comparatively soft wheels.

Wheel wear and grinding wheel costs are accorded too much importance in many shops—a pennywise but pound-foolish policy. It is far more important to protect the cutting tools than it is to reduce grinding wheel costs. The advice of the grinding wheel manufacturers should be obtained in regard to the best type of wheel for the purpose, at the low wheel speeds recommended. In machine grinding, as well, if there is trouble due to overheating, it is wise to make a study of the wheel speeds and the wheel hardness.

Polishing High-Speed Steel and Stellite Cutting Tools

The practice of stoning the cutting edges of tools has long been used by skilled machinists to increase tool life and improve finish. Proper stoning of cutting tools, however, consumes much time and is difficult to do well. The practice of polishing the areas around the cutting edge was a natural development after noting the good effect of stoning. Many years ago, the author became interested in the effects of polishing high-speed steel and Stellite tools, and conducted some experiments. In almost every case, the polishing of the clearance and the top face greatly increased the tool life, the increase amounting to from 50 to 600 per cent. The average increase in life of tools of many types used on different materials was about 100 per cent.

The large savings due to such a great increase in tool life are obvious. The cost of cutting tools would be cut in half. The labor cost for changing tools and the machine "down time" costs would also be cut in half. Moreover, the better and smoother finishes secured by the polished tools would reduce the time necessary for subsequent finishing operations, such as filing, scraping, and polishing, and thus effect substantial savings.

In polishing cutting tools, great care had to be exercised so as not to injure the cutting edge by burning. The polishing was done by very fine grit wheels—400 to 600 grit—with a wheel speed of about 5000 feet per minute, since this wheel speed was available for ordinary grinding. At this high wheel speed, however, it was very difficult not to burn the cutting edge of the tool. The great care necessary under these conditions increased the time required for polishing.

By experimenting, a method of performing the polishing operation quickly and safely was arrived at. A lower wheel speed was found to be all important; from 1600 to 2600 feet per minute proved to be a safe speed. A water-wash over the cutting face of the fine-grit wheel was necessary to keep the wheel clean and cool cutting. A 300- to 400-grit silicon-carbide wheel with a resinoid bond was finally adopted. This wheel produces a good polished surface quickly without excessive heating.

The polishing operation, whenever possible, should simply amount to the polishing of a land about 1/32 to 1/16 inch wide on the front and side clearance angles, and a land about 1/8 to 1/4 inch wide on the top face of the tool. In order to reduce the amount of polishing to a minimum, a double angle of clearance and a double angle of rake are recommended. Only the land on the final clearance or rake angle desired is polished; the rough-ground angles should be from 2 to 5 degrees greater than the polished clearance and rake angles. The double angle of clearance or rake is illustrated in the accompanying diagram. This arrangement greatly reduces the amount of polishing required. It is not necessary to polish the secondary clearance and rake surfaces, since the chip impinges on the cutting face of the tool close to the cutting edge.

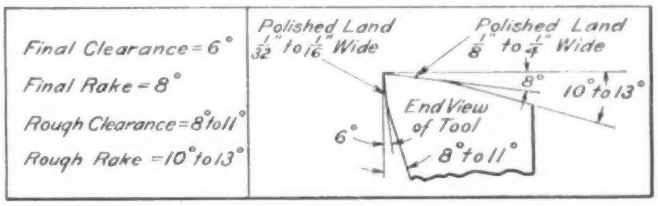
The grinder used for polishing should be provided with a table tilting to definite angles by means of a quadrant, so that the double angles of clearance and rake can be easily controlled.

All types of cutting tools should be polished. Polished-flute drills and taps are already on the market. Single- and multi-point cutting tools, circular form tools, etc., should have polished edges and top faces. It is sometimes difficult to polish the formed contour of certain types of tools, but in such cases, the top face over which the chip flows should be polished, since this has the greatest effect on the tool life. Many tools can be easily polished on the top face as, for example, forming tools, counterbores, reamers, etc.

A screw machine products plant that has adopted this polishing practice on practically all types of tools states that an average increase in tool life of 100 per cent has been secured. Many of the tools used in this shop are polished on the top face only. Single-point tools are polished on the clearance angles, as well as on the top face.

Why is There a Marked Increase in the Life of Polished Tools?

Polished tools show a great increase in life mainly for two reasons: (1) Polished clearance angles eliminate the rough "wire edge" produced by grinding. The smooth edge produced by polishing reduces the wear on the clearance angles and delays the formation of the "wear land." (2) Polished top faces decrease the friction between the



Diagrammatic View Showing, in Exaggerated Manner, the Width of Land and the Rake and Clearance Angles of a Cutting Tool

chip and the face of the tool. This reduces the generation of heat which ordinarily causes a cutting tool to fail.

It is well known that a ground surface or edge consists of a series of hills and valleys. When a ground tool that has not been polished starts to cut, the hills initially take the load and begin to heat up. The areas at the top of the hills are very small, and the frictional heat produced by the chip is concentrated on these small areas, causing the tool material in these areas to soften. In a short time, these hills are worn down, causing a loss of cutting edge clearance, which, in turn, creates additional rubbing against the work being machined. This, in turn, means more frictional heat and an acceleration of the loss of the clearance.

This loss of clearance takes place more quickly when the cutting edge is made up of a series of hills and valleys produced by grinding than when the cutting edge is made quite uniform through polishing. The loss of clearance is delayed by polishing, because it partly eliminates the hills and valleys referred to. With the polished edge, the frictional heat generated is spread along the entire cutting edge, and is not concentrated on the small areas on the top of the hills created by grinding. This uniform heating of the entire cutting edge keeps down the temperature in the cutting edge area, and hence helps to increase the tool life.

Stoning of the cutting edge removes the hills to some extent, and, consequently, increases the

life of the cutting tool; but polishing is far more satisfactory and effective. Polishing is also a much more rapid operation than stoning, and can be performed on a grinder designed for this work.

Let us now consider the case where a chip slides over the ground top surface of a cutting tool with the grinding marks at right angles to the flow of the chip. Here, again, as the chip slides over the hills, the frictional heat is concentrated on the small areas at the top of the hills, softening the tool material in these areas and causing wear. This wear hastens the formation of a "crater," a condition that has frequently been called attention to in articles on cutting tool action.

The crater edge, when it is first formed, is some distance from the cutting edge, because as the chip is wedged off from the material being cut, it impinges on the top face of the tool some distance away from the cutting edge; but the size of the crater grows, due to the abrasive action of the sliding chip, and the edge of the crater comes closer and closer to the cutting edge, making a very sharp point or angle at the edge. This small point of the tool produced by the growing crater has a much reduced heat-dissipating area. Ultimately, the temperature of the cutting edge, therefore, softens the cutting material next to the edge, resulting in rapid wear and early tool failure.

A polished surface on the top face of the cutting tool over which the sliding chip flows delays the formation of the crater, and, hence this polished surface increases the tool life. The reason for this is that the sliding chip impinges on the smooth sliding surfaces, spreading the frictional heat uniformly over a wider area instead of concentrating it on the hills formed in grinding. Professor Boston, of the University of Michigan, measured the temperature of the top face of a tool while cutting. He found this temperature to be around 1600 degrees F. soon after the tool started to cut. This indicates the need for adequate dissipation of this heat.

Importance of Having Grinding or Polishing Marks Parallel to the Flow of Chips

Since the grinding marks, if they are perpendicular to the flow of the sliding chip, act as a brake to the movement of the chip, and consequently create more frictional heat than if the grinding marks were parallel to the chip flow, it is always best, when possible, to grind and polish the top face of a cutting tool in such a way that the grinding or polishing marks will be parallel to the flow of the sliding chip. The increase in the life of cutting tools quoted in previous paragraphs should be sufficient evidence to convince anyone that the adoption of the suggested method of polishing high-speed steel and Stellite tools is well worth while, and that the new method of grinding and polishing outlined will prove an important step forward in machine shop practice.

Grinding and Diamond-Lapping of Cemented-Carbide Tools

Part of the trouble experienced with cemented-carbide tools from breakage and chipping of the edge can be traced to the grinding and lapping operations. Most of the difficulty is caused by too high grinding and lapping wheel speeds. Wheel speeds of about 5000 feet per minute have been recommended for these operations. For many years, these high wheel speeds have not been questioned; but since the advent of the steel-cutting carbide grades, wheel speeds have been given more thought.

Steel-cutting carbides contain tantalum or titanium carbide in addition to tungsten carbide. The thermal conductivity of the carbides containing titanium or tantalum is only from one-fourth to one-half the thermal conductivity of tungsten-carbide grades, depending on the composition. The very low thermal conductivity of the steel-cutting grades brought up a serious problem in grinding and lapping that did not appear when handling the tungsten-carbide grades. The steel-cutting grades are more easily damaged by the grinding and lapping operations than the other grades.

The high grinding and diamond-lapping wheel speeds that have generally been used up to this time are likely to damage the steel-cutting carbides, causing checking in grinding and undue breakage and edge-chipping while in use.

The new method of grinding and diamond-lapping is mainly a matter of wheel speeds. These speeds have been reduced to about one-half those recommended up to this time, the new method using a speed of 2600 feet per minute or even less. With this reduced speed, it is possible to grind and diamond-lap any type of carbide without generating heat detrimental to the cutting tool material.

It is also possible, with the lower speeds, to use safely silicon-carbide wheels that are from two to three grades harder than would be used at the higher speeds. Wheel hardnesses similar to J (Norton) and P (Carborundum) can be safely used at these reduced wheel speeds. To safely grind and diamond-lap the steel-cutting carbides, it is imperative that the low speeds recommended in this new method of grinding carbide tools be used.

As stated, the 5000 feet per minute speed formerly recommended did not seem to injure the tungsten-carbide grades. Since the introduction of the new method of using low wheel speeds, it has been observed that the tungsten-carbide grades —especially the hardest grades—were also adversely affected at times by the high heat produced by the higher wheel speeds. In many cases, the tool life of all grades of carbides has been increased by the slower wheel speeds. In one instance, a 400 per cent increase in tool life of tungsten carbide was observed. This tool was ground and lapped by both methods a number of times, and in every case, the new slow speed method gave a 400 per cent

increase in life. Shops using the new method have reported increased tool life and a decided decrease in carbide tool breakage and edge-chipping.

In the last two years, grinding and diamond-lapping speeds have been reduced in a number of cases in Europe to about the wheel speeds recommended here. The diamond metal wheel is favored by the author because of its high heat conductivity. This reduces the heat produced by the lapping operation, and, consequently, decreases the hazard of checking the carbide tip.

Control of Clearance and Rake Angles

Accurate clearance and rake angles on carbide tools are very important. Too great clearance angles on these tools cause excessive breakage. Today, therefore, most carbide tools are ground to definite clearance and rake angles, and the majority of users have tool grinders with tables adjusted by quadrants. This type of grinding and lapping equipment is recommended in connection with the method outlined in this article. To secure the best performance from carbide tools, the clearance and rake angles must be controlled accurately.

Diamond-Lapping of Cemented-Carbide Cutting Edges

In the new method outlined, the use of the diamond lap as a means of securing a strong, unbroken cutting edge on carbide tools is recommended. Diamond-lapping has long been recognized as valuable in obtaining the best performance from these tools. It produces a very keen cutting edge and increases the average tool life.

The double angle of clearance previously described in this article is resorted to in diamond-lapping carbide tools. The method is similar to that referred to in connection with high-speed steel and Stellite tools (see illustration).

The T. C. M. Mfg. Co., Harrison, N. J., demonstrated the new method of grinding and polishing high-speed steel and Stellite tools and of grinding and diamond-lapping carbide tools at the Tool Show held in Detroit last spring. The new method of handling all types of tools was demonstrated on the "All-In-One" grinder made by the company. This grinder uses a 6-inch diameter cup-wheel and operates at a speed of 1740 revolutions per minute, giving wheel speeds of from 1600 to 2600 feet per minute on the cup face of the wheel. The demonstration convinced many visitors that it was practically impossible to injure the cutting tools in grinding, polishing, and diamond-lapping.

The method of handling cutting tools outlined in this article is worthy of consideration by machine shop executives, because of the large savings that can be made through better tool performance. The return obtained from a large machine tool investment can be greatly increased if the method used for grinding, polishing, and diamond-lapping of cutting tools is given the attention that it deserves.

John Fritz Medal Awarded to the Late Dr. C. F. Hirshfeld

Dr. Clarence Floyd Hirshfeld, who passed away April 19, this year, has been given a posthumous award of the John Fritz gold medal, one of the highest honors in engineering bestowed by the engineering societies of the United States. Dr. Hirshfeld was considered as a candidate for the medal previous to his death, and the award is, therefore, made at this time. Dr. Hirshfeld was chief of research of the Detroit Edison Co., Detroit, Mich., and receives the medal "for notable leadership through research and development in power generation and electric traction, and for being a great teacher and friend of men, both young and old."

Dr. Hirshfeld was born in San Francisco in 1881. He graduated from the University of California with the degree of bachelor of science in electrical engineering in 1902, and from Cornell University with the degree of master of mechanical engineering in 1905. He received the honorary degree of doctor of engineering from Rensselaer Polytechnic Institute in 1932.

From 1903 to 1914 he taught at Cornell University, where he became professor of mechanical engineering. Since that time until his death, he was connected with the Detroit Edison Co. During the World War, he served first as major, and then as lieutenant colonel, in the Ordnance Department of the United States Army. He was a man of most unusual versatility and mental capacity, able to grasp and handle simultaneously a great number of different problems and activities. He was also a man of outstanding personality.

* * *

Lectures on the Cold-Working of Metals

The Carnegie Institute of Technology, Pittsburgh, Pa., is arranging a course of nine lectures, with discussions, on the cold-working of metals, to be held during the week of December 4 to 8. The nine lectures are as follows: Nature of Cold Work; Preferred Orientations and Directional Properties; Effect of Cold Work on Mechanical Properties; Flow of Metals in Forming Operations; Cold-Rolling; Deep Drawing of Steel Sheet; Wire, Bar, and Tube Drawing; Recovery and Recrystallization; and Practical Annealing. A registration fee of $10 is charged for the full course. The meetings will be held in Room 104, Industries Hall, Carnegie Institute of Technology, Schenley Park, Pittsburgh, Pa.

* * *

Texas is not only the largest state in the United States, but it also has the largest railway mileage —16,496 miles. Illinois comes second with 12,064 miles, and Pennsylvania third with 10,719 miles.

Radically New Method of Annealing Wire Reduces Costs and Increases Output

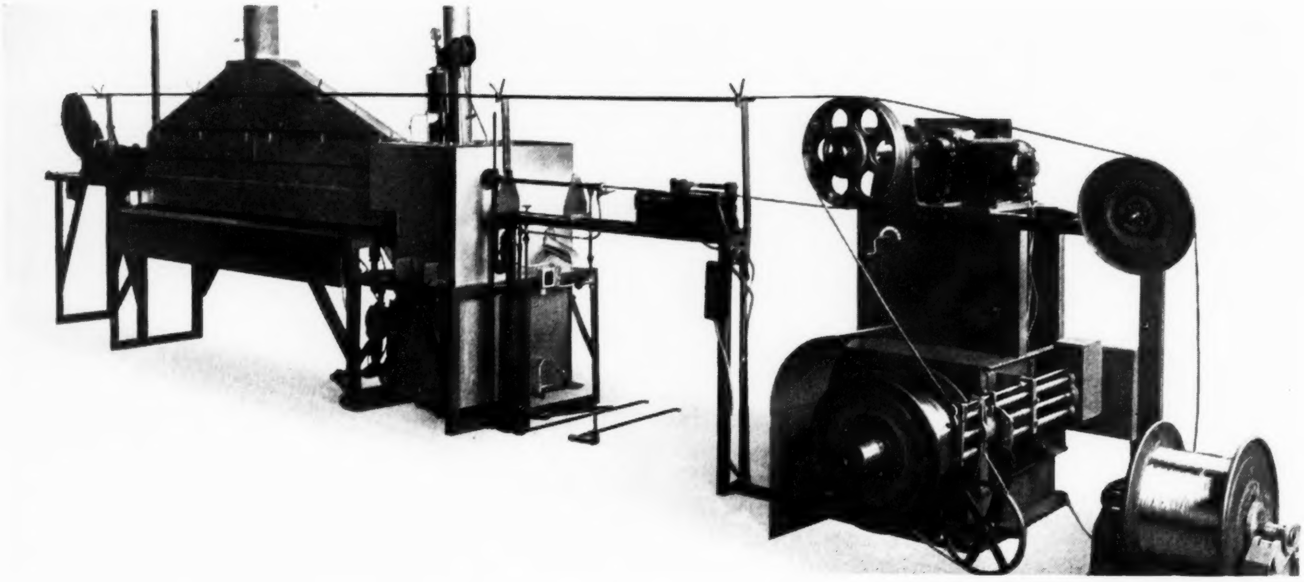


Fig. 1. A Complete Installation of the New Syncro Equipment for Bright-annealing Wire at High Speed in Open Flames

AN entirely new continuous wire-annealing method, using open gas flames for heating without the use of a furnace in the ordinary sense of the word, has been developed by the Syncro Machine Co., Rahway, N. J., in cooperation with the Surface Combustion Corporation, Toledo, Ohio. This method makes it possible to anneal wire at speeds as high as 1500 feet per minute without the use of either furnace or atmosphere-tube, and to produce a uniformly bright-annealed product at much less cost for fuel, labor, and equipment than formerly. The equipment has been thoroughly tried out in practice and has been found efficient and dependable.

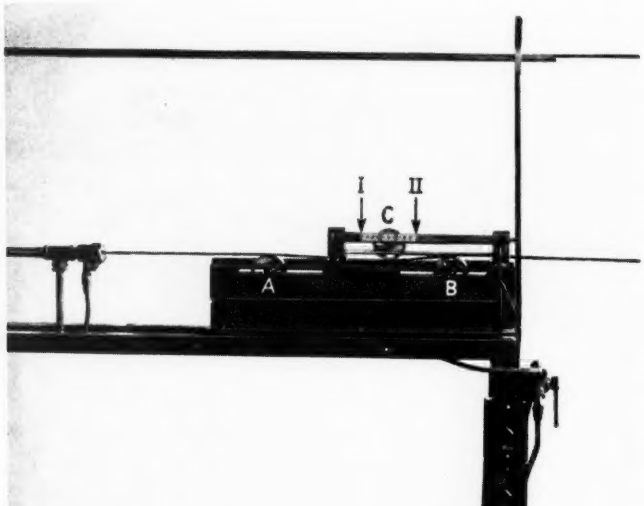


Fig. 2. The Wire Anneal Indicator that Automatically Shows the Degree of Anneal of the Wire as it Passes through the Indicator at High Speed

Briefly, the annealing is done by a long row of accurately controlled gas flames, so arranged with reference to positioning dies or guides that the wire passes through exactly that portion of each flame in which combustion has advanced to the point where both the temperature and the composition of the burning gas are correct for the annealing. This annealing effect can be modified by either the height and character of the flames or by the speed of the wire as it passes through the flames. The burners are enclosed in a sheet-metal housing, as shown to the left in Fig. 1. From there, the wire passes through a continuous anneal indicator, shown in the center of the illustration, and is finally wound up on a reel. The reel that holds the unannealed wire is shown to the extreme right in the illustration.

From the anneal burners, the wire may pass directly through a water-quench tube and emerge bright-annealed, or, as shown in the illustration, it may pass through a continuous pickling, tinning, wiping, and burnishing device before being quenched, dried, and spooled as coated material.

Especial interest is attached to the device developed to provide a constant visual indication of the quality of the anneal—a device that may be

used as an automatic control of either the wire speed or the flame height, so as to keep the anneal at a constant value. This device, as shown in the center of Fig. 1 and in a close-up view in Fig. 2, is located just beyond the point where the wire passes from the quenching tube. It consists of two fixed wheels *A* and *B*, over which the wire passes and between which it is depressed by a floating wheel *C*, mounted on ball bearings and guided by longitudinal rods located behind the scale bar. Obviously, this wheel will have a tendency to move forward from its normal mid-position between *A* and *B* with the forward motion of the wire. The degree to which it floats forward is in inverse proportion to the hardness or springiness of the wire, and, hence, a measure of the anneal.

In Fig. 2, the Position I would be assumed by the floating reel if the wire were 100 per cent hard or springy, while Position II would be assumed if the wire were extremely soft. Points between these two locations can be calibrated against actual tests to furnish the anneal indication at a given wire speed and tension. It would be possible to arrange the floating wheel to actuate the movable contact of a Wheatstone bridge or to interrupt beams directed at photo-electric cells, and thus automatically control either wire speed or flame characteristics to obtain the degree of anneal desired.

The two especially interesting points relating to the new Syncro continuous open-flame annealer are (1) that it adapts the mechanical principles of automatic machine equipment to work heretofore considered simply as a furnace job; and (2) that it represents a complete production line composed of a sequence of separate ingenious elements capable of variations or adjustments, so that this new principle of open-flame annealing can be adapted to a wide range of wire products and individual plant requirements.

* * *

Meeting of Meehanite Research Institute

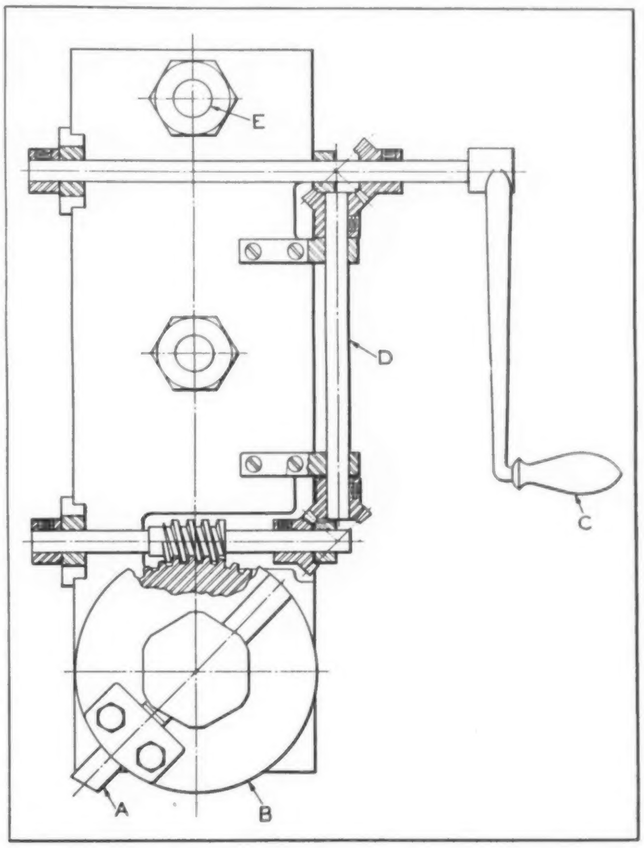
The annual meeting of the Meehanite Research Institute of America, Inc., was held in Detroit, Mich., on November 1 to 3. More than fifty papers describing the results of research in the metallurgy of Meehanite and foundry technique were presented. One afternoon session was devoted to the discussion of selling, advertising, and sales promotion.

All the officers of the Institute were re-elected as follows: President, O. Smalley, president of the Meehanite Metal Corporation, Pittsburgh, Pa.; vice-president, H. B. Hanley, foundry manager of the American Laundry Machinery Co., Rochester, N. Y.; secretary-treasurer, F. M. Robbins, president of Ross-Meehan Foundries, Chattanooga, Tenn. The meeting was attended by ninety-three representatives of Meehanite manufacturers in the United States and Canada. The headquarters of the Institute are at 311 Ross St., Pittsburgh, Pa.

Radius Turning Tool for Machining Recess in Aluminum Casting

The machining of an annular groove, or recess of circular form, in a large aluminum pattern for a furnace top was accomplished satisfactorily on a boring machine equipped with the special radius turning tool shown in the accompanying illustration. This tool was designed by **Fred Mayer**, superintendent of the Phoenix Machine Co.'s plant at Cleveland, Ohio, where the work was performed.

Referring to the illustration, tool *A* is mounted on holder *B* which has worm teeth cut in its periphery.



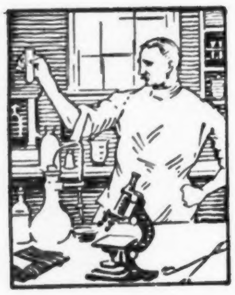
Special Tool Used on Boring Mill for Machining Radius-formed Annular Groove in Large Aluminum Casting

Rotation of holder *B* for radius boring or turning is accomplished by means of handle *C* through the bevel gears and worm mounted on shafts arranged as shown. Vertical shaft *D* is of sufficient length to bring handle *C* high enough to clear the table of the machine or the work mounted on the table. Bolts *E* are provided for clamping the tool to the vertical tool-slide. The tool can also be applied to a vertical boring mill or a lathe.

* * *

In pioneering a new idea, it is often easier to get results than to convince others that it is possible to get results.

MATERIALS OF INDUSTRY

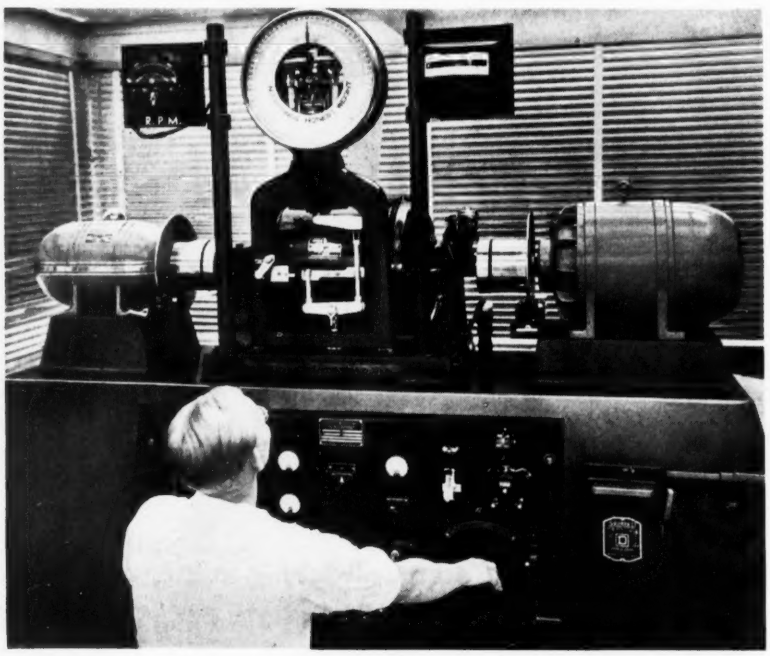


THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

"Fiberglas"-Insulated Motor Much Smaller than Standard Type

One of the interesting applications of "Fiberglas" is for the insulation of electric motors. Just how extensively this material may be used for the purpose cannot be predicted at the present time, but the performances of "Fiberglas"-insulated motors indicate great possibilities.

The accompanying illustration shows a practical demonstration, which was given at the World's Fair Exhibit of the Owens-Corning Fiberglas Corporation. Two motors are connected to a dynamometer. The motor at the left is completely "Fiberglas"-insulated; the one at the right has cotton insulation. Each of the motors has a continuous rating of 10 H.P., but it will be noted that the "Fiberglas"-insulated motor is much smaller than the other one. In fact, the space occupied by the motor at the left is 45 per cent less than that required for the standard motor.



Comparatively Small "Fiberglas"-insulated Motor at Left Develops Same Power as Standard Cotton-insulated Motor at Right

The weight of the 'Fiberglas"-insulated motor is 190 pounds, and its frame size is a standard No. 254, which is normal for a 5-H.P. motor. The motor at the right weighs 354 pounds, and its frame size is No. 324, so that the space occupied is nearly twice that of the "Fiberglas"-insulated motor of the same horsepower. This space saving may be an important factor in connection with machine tool and other drives requiring a compact design...201

Protect-O-Metal, a Compound for Use in Welding and Die-Casting

A new compound known as "Protect-O-Metal," manufactured by G. W. Smith & Sons, 2016 E. Third St., Dayton, Ohio, promises to be of considerable value in the welding and die-casting fields. In the welding field, the compound prevents corrosion and the collection of spatter on the surface surrounding the weld, thus eliminating weld cleaning. The compound is simply brushed on the surface to be welded. After welding, the surface is wiped with a cloth or washed with water, and all spatter and surface oxides are removed. The compound also forms a suitable priming coat for a paint finish, and prevents the formation of rust on steel after welding.

When the compound is sprayed or brushed (preferably sprayed) on a die-casting die, it forms a heat-resisting coating and prevents the molten metal from sticking to the mold, thus allowing easy ejection of the die-castings. The protective film which it forms is not burned off in making one casting, but maintains its protective qualities for at least twenty-five successive castings. Owing to the easy ejection of the casting, more castings can be made in one die than was formerly possible. The compound is also said to be effective for deep drawing dies, permanent molds, and drop-forging dies. 202

To obtain additional information about materials described on this page, see lower part of page 278.

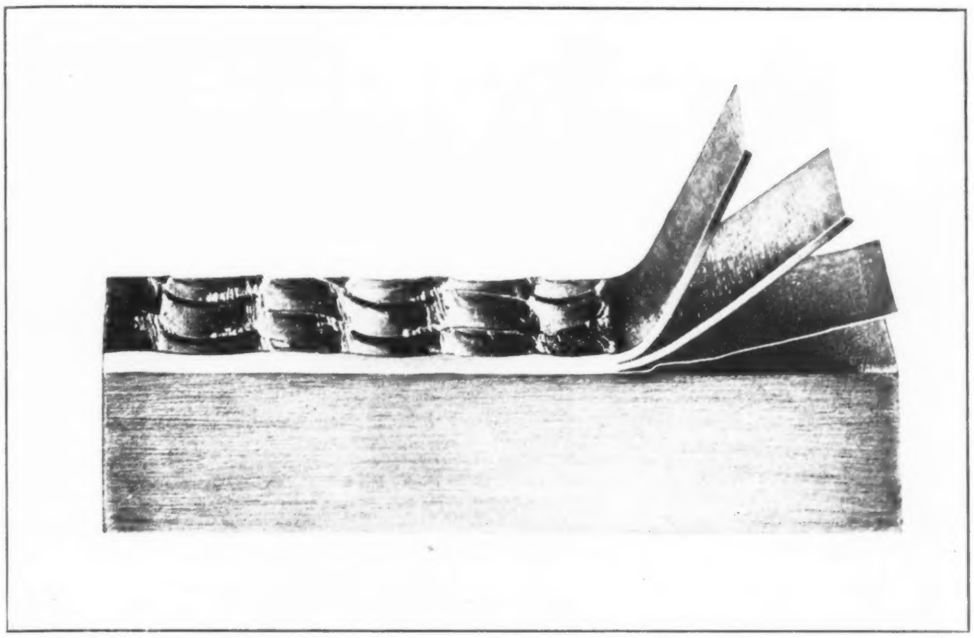


Fig. 1. Specimen of Croloy Bonded Plate Made with Two Chromium Steel Sheets and One Nickel Sheet, Welded to the Baseplate

Stainless-Steel Clad Carbon-Molybdenum Plate for High-Temperature Service

Carbon-molybdenum steel has become firmly established as an economical and effective material for service where temperatures do not exceed 1000 degrees F. and corrosion is not an important factor, according to the *Moly Matrix*, published by the Climax Molybdenum Co., New York City. An improvement in the corrosion resistance of this steel would considerably widen its field of usefulness, as there are many possible applications where carbon-molybdenum steel could meet the creep strength requirements, but where corrosion conditions would preclude its use.

To provide the necessary corrosion resistance to carbon-molybdenum steel for such applications, the Babcock & Wilcox Co., Beaver Falls, Pa., has developed what is known as "Croloy" bonded plate, which consists essentially of thin sheets of chromium stainless steel, resistance-welded to a baseplate of carbon-molybdenum steel. In these plates, the uniformity and permanence of the bond are insured by using two or more sheets of chromium steel with a sheet of nickel interposed between them and the baseplate, as illustrated in Fig. 1. Welding of the sheets to the baseplate is accomplished by making individual spot-welds, which overlap lengthwise and crosswise on the plate, as shown in Fig. 2.

The construction of Croloy bonded plate provides the electrical resistance necessary for the generation of welding heat by increasing the number of contacts between the electrodes and the base metal. It also reduces the pressure on the chromium sheets necessary to complete the bond. Being thin, the sheets can be pressed into place during welding by applying less pressure than would be required in the case of a single sheet of equivalent overall thickness. There is also less distortion of the sheets than would be the case with a single layer that is applied with greater pressure while the metal is hot and is therefore more readily deformed. Minimum distortion during welding of the sheets, which are of known thickness, results in a veneer of known thickness on the baseplate.

The nickel sheet has another important influence on the permanence and uniformity of the bond. Since nickel does not have the affinity for carbon that chromium has, the nickel sheet prevents the migration of carbon from the metal of the baseplate to that of the lining.

The fact that the bonded plate can be subjected to high temperature without deterioration permits heat-treatment after welding. As a matter of fact, the bonded plate is normalized at 1650 degrees F. to improve the physical properties of the baseplate and to toughen the steel of the lining. The bonded plate can be fabricated without difficulty, as rolling or pressing has no effect on the permanence of the bond. The plate can be hot-formed, spun, or welded as easily as unbonded plate...........203

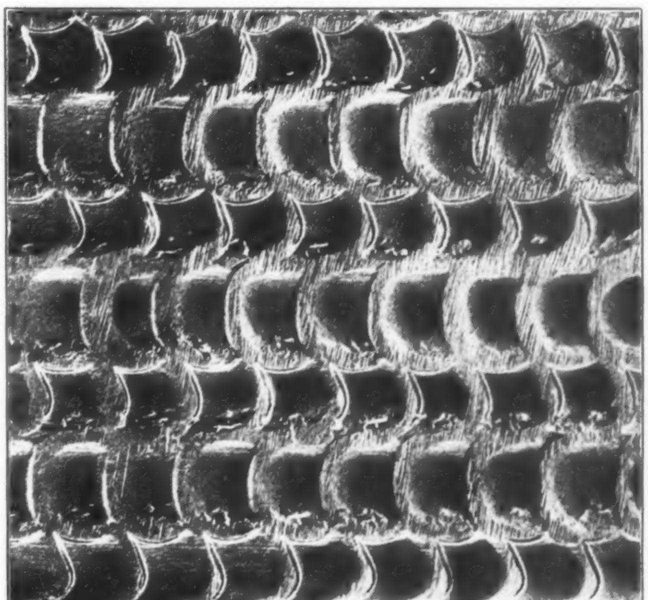


Fig. 2. Overlapping Welds Made in Welding Chromium and Nickel Steel Sheets to Croloy Bonded Plate

To obtain additional information about materials described on this page, see lower part of page 278.

NEW TRADE

LITERATURE

Multiple-Spindle Automatics

NATIONAL ACME CO., 170 E. 131st St., Cleveland, Ohio. "Handbook for Operators of Acme-Gridley Multiple-spindle Bar Machines," covering in complete detail the design, construction, tooling and operation of four-, six-, and eight-spindle machines. Free to foremen, set-up men, and operators actively engaged in production on Models R and RA multiple-spindle bar machines; to others, a price of 50 cents is charged. 1

Leather Belting

AMERICAN LEATHER BELTING ASSOCIATION, 100 Gold St., New York City. Publication entitled "Automatic Tension Control Short-Center Pivoted-Motor Leather Belt Drives," containing complete information on the advantages, efficiency, belt life, first cost, and design data relating to such belt drives; especially intended for the information of plant engineers and superintendents. 2

Contour Sawing Machines

CONTINENTAL MACHINES, INC., 1301 Washington Ave. S., Minneapolis, Minn. Contour sawing handbook containing 160 pages and over 300 illustrations, as well as charts and other data on contour sawing. Detailed information is given on the application of the process, as well as data on the selection and cutting speeds of saws. 3

Arc-Welding Equipment

LINCOLN ELECTRIC CO., Cleveland, Ohio. Bulletin 401, descriptive of arc-welding electrodes and accessories, including instructions on the procedure to be followed in welding various metals. Bulletin 412-A, illustrating and describing the new Lincoln "Shield Arc" welder with self-indicating dual continuous control. 4

Steel Handbook

UNION DRAWN STEEL DIVISION OF REPUBLIC STEEL CORPORATION, Cleveland, Ohio. Fourth edition of the "Steel Handbook for Machine Tool Users," containing much information of value to machine tool users, including tables of recommended cutting speeds and feeds for many grades of carbon, alloy, and stainless steel, and other machining data. 5

Recent Publications on Machine Shop Equipment, Unit Parts and Materials. To Obtain Copies, Check on Form at Bottom of Page 277 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the December Number of MACHINERY

Die-Heads

EASTERN MACHINE SCREW CORPORATION, 23-43 Barclay St., New Haven, Conn. Bulletins 10, 11, and 12, illustrating and describing, respectively, H & G insert-chaser die-heads; Style MM insert-chaser die-heads for rotary spindles; and stationary insert-chaser die-heads for turret lathes and hand screw machines. 6

Electric Equipment

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Booklet F-8495, descriptive of motor parts for built-in universal motor applications of 1/150 to 1 H.P. "Quick Selector" catalogue 30-000, designed to help the user of electrical apparatus select the right equipment for a motor or lighting circuit. 7

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Circulars GEA-1191B, 1811B, 1945A, 2022C and 3268, describing, respectively, synchronous motors; plunger type relays; synchronous motor-generator sets; diactor generator-voltage regulators; air circuit-breakers applicable to machine tool operation. 8

Time-Delay Relay

PARTLOW CORPORATION, New Hartford (Suburb of Utica), N. Y. Circular illustrating and describing the operation of the Partlow new electric time-delay relay, a self-contained timer for automatically starting or stopping a process cycle after a predetermined lapse of time. 9

Semi-Automatic Threading Machines

LANDIS MACHINE CO., INC., Waynesboro, Pa. Bulletin E-88-1, illustrating and describing the Landis four-spindle semi-automatic threading machine, a precision machine designed for threading automotive parts, bolts, rods, etc., on a high-production basis. 10

Floor Sanders and Refinishing Equipment

PORTER-CABLE MACHINE CO., Syracuse, N. Y. Booklet entitled "Modern Maintenance Methods," illustrating the use of portable equipment for floor maintenance and refinishing operations on metal, wood, stone, and similar materials. 11

Tapping Equipment

R. G. HASKINS CO., 617 S. California Ave., Chicago, Ill. Chart showing tap drill sizes and percentages of threads that can be obtained with them. For each different size of tap, three and sometimes four tap drill sizes are given, in both metric and English measurements. 12

Low-Temperature-Melting Alloy

CERRO DE PASCO COPPER CORPORATION, 44 Wall St., New York City. Manual describing the uses and methods of applying Cerromatrix, a low-temperature-melting alloy used for securing punch and die parts permanently in place, for anchoring machine parts, etc. 13

Steel Stitching Machine

SEYBOLD DIVISION, HARRIS-SEYBOLD-POTTER CO., Dayton, Ohio. Circular describing a new type of machine for stitching steel, applicable in automotive shops or wherever sheet metal is required to be attached to other material quickly and permanently. 14

High-Production Lathes

R. K. LEBLOND MACHINE TOOL Co., Cincinnati, Ohio. Bulletin 11-19, entitled "Doubling Production per Hour," descriptive of five classes of LeBlond heavy-duty rapid-production lathes. The last two pages of the book show a few of the many tool set-ups designed to increase production on specific jobs. 15

Precision Lathes

SOUTH BEND LATHE WORKS, 781 E. Madison St., South Bend, Ind. Catalogue 100, containing 112 pages showing 75 different sizes and types of South Bend back-geared screw-cutting lathes for production manufacturing, tool-room, and general shop work. 16

Electric Arc-Welding Generator

WILSON WELDER AND METALS Co., INC., 60 E. 42nd St., New York City. Bulletin describing the Hornet electric arc-welding generator, designed to require a minimum of the operator's attention; also data on the Yellow Jacket pipe line welder. 17

High-Speed Milling Attachment

RUSNOK TOOL WORKS, Chicago, Ill. (Selling agent, Lockwin & Co., 205 W. Wacker Drive, Chicago, Ill.) Bulletin illustrating and describing the Rusnok high-speed motor-driven milling attachment designed to convert horizontal milling machines into universal milling machines. 18

Speed-Reducing Units

PHILADELPHIA GEAR WORKS, Erie Ave. and G St., Philadelphia, Pa. Catalogue containing 64 pages covering this company's complete line of single-, double-, and triple-reduction herringbone speed-reducing units, which are available in an extremely wide range of sizes. Couplings and a number of other Philadelphia products are also described. 19

Designing with Stainless Steel

CARPENTER STEEL Co., 105 W. Bern St., Reading, Pa. Booklet entitled "Design," containing information helpful to designers or others who use or are contemplating the use of stainless steel in their product. The data given will enable the user to select the best and most economical grade for the purpose. 20

Internal Lapping and Grinding Machines

EX-CELL-O CORPORATION, 1200 Oakman Blvd., Detroit, Mich. Bulletin 13991, on Ex-Cell-O internal lapping machines. Bulletin 14291, on a new Ex-Cell-O precision internal thread-grinding machine. 21

Air Compressors

EMPIRE COMPRESSOR MFG. Co., INC., Benson St. and Pennsylvania Railroad, Reading (Cincinnati), Ohio. Folder illustrating and describing two- and four-cylinder air compressors known by the trade name "Empire Pressure King." 22

Ball Bearings

BEARINGS Co. OF AMERICA, Lancaster, Pa. Thirteenth edition of an engineering data book containing information of value to designers and users of ball bearings. The various types and sizes of BCA ball bearings are also listed and illustrated. 23

Rexalloy Tool Bits

CRUCIBLE STEEL Co. OF AMERICA, 405 Lexington Ave., New York City. Circular T.S.401, describing applications of Rexalloy tool bits and giving suggestions for their proper use, correct grinding procedure, speeds and feeds for turning, etc. 24

Surface Hardening Equipment

OHIO CRANKSHAFT Co., Cleveland, Ohio. Bulletin describing in detail the Tocco process of surface hardening by induction. Circular illustrating and describing the Tocco Junior, a new low-cost machine for surface-hardening small parts. 25

Rolled Composite Die Sections

JESSOP STEEL Co., 605 Green St., Washington, Pa. Wall chart giving specifications, weights per foot, etc., for the company's rolled composite die sections, used in dies for cutting sheet metal to regular or irregular shapes. 26

Welding Equipment

PROGRESSIVE WELDER Co., 717 Piquette Ave., Detroit, Mich., is dis-

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[SEE OTHER SIDE]

tributing a monthly publication entitled the "Welding and Punching Pictorial," containing illustrations showing interesting welding, punching, and riveting applications. 27

Cone-Drive Worm-Gearing

MICHIGAN TOOL CO., Cone Worm Gear Division, Detroit, Mich. Engineering manual containing design data on Cone-Drive worm-gearing. The manual also contains specifications of standard Cone-Drive speed reducers. 28

Drilling Machines and Jig Borers

BRYANT MACHINERY & ENGINEERING CO., 400 W. Madison St., Chicago, Ill. Catalogue 200, illustrating and describing the Cleereman jig borer and Cleereman high-speed drilling, boring, and tapping machines. 29

Squaring and Rotary Shears

NIAGARA MACHINE & TOOL WORKS, 637-697 Northland Ave., Buffalo, N. Y. Bulletin 80-C, illustrating and describing the latest Niagara foot-operated squaring shears and hand-operated rotary shears. 30

Wire-Rope Clamp

NATIONAL PRODUCTION CO., 4561 St. Jean Ave., Detroit, Mich. Circular descriptive of the "Safe Line" wire-rope clamp, which provides protection for the workmen's hands and saves time by eliminating splicing. 31

Ball Bearings

NEW DEPARTURE DIVISION GENERAL MOTORS CORPORATION, Bristol, Conn. Loose-leaf circular describing the application of precision ball bearings in a horizontal boring and milling machine headstock. 32

Diemakers' Supplies

DANLY MACHINE SPECIALTIES, INC., 2112 S. 52nd Ave., Chicago, Ill. General catalogue containing 104 pages covering this company's line of die sets and diemakers' supplies. Complete specifications are given, and the book is provided with a thumb-index for ready reference. 33

Drilling and Tapping Equipment

AVEY DRILLING MACHINE CO., Cincinnati, Ohio. Catalogue 39, showing typical examples of the Avey line of drilling and tapping machines, which are made in single- and multiple-spindle types. Data on ranges, speeds, etc., are included. 34

Bench Grinders

CRYSTAL LAKE MACHINE WORKS, Crystal Lake, Ill. Bulletin descriptive of a new bench grinder, with a micrometer stop, for production, tool, and experimental work. 35

Finishing Methods

MAAS & WALDSTEIN, 438 Riverside Ave., Newark, N. J. Pamphlet containing a comprehensive review of modern methods of applying lacquers and enamels to metal products. 36

Geared Pumps

BROWN & SHARPE MFG. CO., Providence, R. I. Circular containing data on a new 500 series line of rotary geared pumps with herringbone gears, including performance charts. 37

Steel Belt Lacing and Fasteners

FLEXIBLE STEEL LACING CO., 4607 Lexington St., Chicago, Ill. Bulletin V-200, covering a new line of Alligator V-belt fixtures for cross-woven fabric V-belts. 38

Oilless Bearings

R. W. RHOADES METALINE CO., INC., Long Island City, N. Y. Catalogue describing Rhoades metaline oilless bronze bearings and their uses. 39

Portable Electric Tools

BLACK & DECKER MFG. CO., Towson, Md. Booklet containing information on the proper care and maintenance of portable electric tools. 40

Stacking Units

GORDON L. HALL CO., Old Lyme, Conn. Circular descriptive of "Bin-rack" built-up stacking units for storage and assembly. 41

Variable-Speed Control

REEVES PULLEY CO., Columbus, Ind. Circular illustrating typical applications of the Reeves variable-speed control. 42

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 279-295 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment mark with X in the squares below, the identifying number found at the end of each description on pages 279-295—or write directly to the manufacturer, mentioning machine as described in December MACHINERY.

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Fill in your name and address on other side of this blank.

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 274-275 mark with X in the squares below, the identifying number found at end of each description on pages 274-275—or write directly to the manufacturer, mentioning name of material as described in December MACHINERY.

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Fill in your name and address on other side of this blank.

Detach and mail to MACHINERY, 148 Lafayette St., New York, N. Y.

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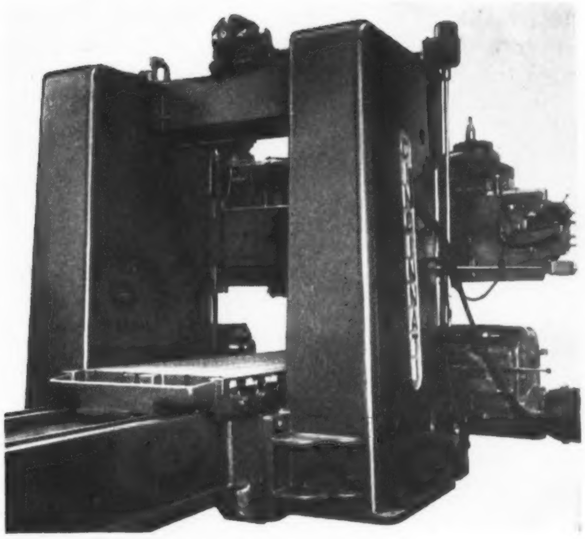
Shop Equipment News

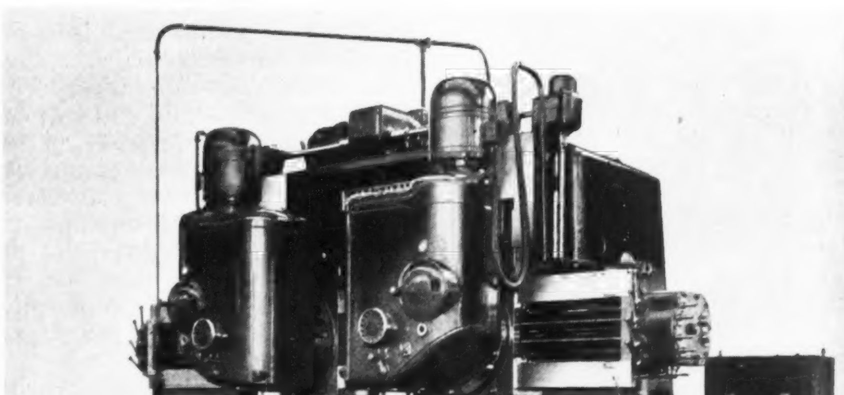


Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

Cincinnati Hypro Planer Type Milling Machine

Operating flexibility is an outstanding feature of the new 9 1/2-inch quill, 60-inch by 48-inch by 14-foot Hypro planer type milling machine brought out by the Cincinnati Planer Co., Cincinnati, Ohio. All feeding and power-traversing movements of this machine can be controlled by the operator from the central pendent station which can be swung to any convenient position on either side of the machine. There are twelve cross and down feeds to each head, and also a range of twelve feeds for feeding the table in either direction. The feed and power traverse of all heads, as well as the table, are independent of one another.

All milling heads are completely self-contained units, driven by an individual 20-H.P. motor and lubricated by an individual pump. Each head has eight spindle speeds. These speeds are obtained by revolving a single cam which has a dial that indicates the various speeds. Each head is provided with a safety device, which prevents it from damage should it be fed too far in any direction.



Hypro Planer Type Milling Machine with Central Pendent Station Control

The gear drive for the table is completely enclosed inside the bed. All gears of this drive are of the herringbone type, which deliver a smooth straight-line flow of power to the table under the heaviest milling operations. This design provides a perfectly balanced train of gears, free from power losses due to side thrust pressure. A unique clamping device mounted on the bed in a convenient location for the operator locks the table in position for cross-milling operations without exerting side or downward pressure on the table or changing the oil film between the bed and the table vees.

The deep box type cross-rail is designed to provide a narrow horizontal guide bearing to prevent binding of the head saddle during cross-travel. The saddles are suspended from the rail by anti-friction rollers which run on a hardened and ground inlaid steel strip extending the full length of the rail. The rails are electrically clamped to the housings. Clamping pressure is equalized on a two-point bearing contact with the housings. An interlock between the rail-clamping and rail-elevating de-

To obtain additional information on equipment described on this page, see lower part of page 278.

vices makes it impossible to damage either by attempting to lower or raise the rail while locked.

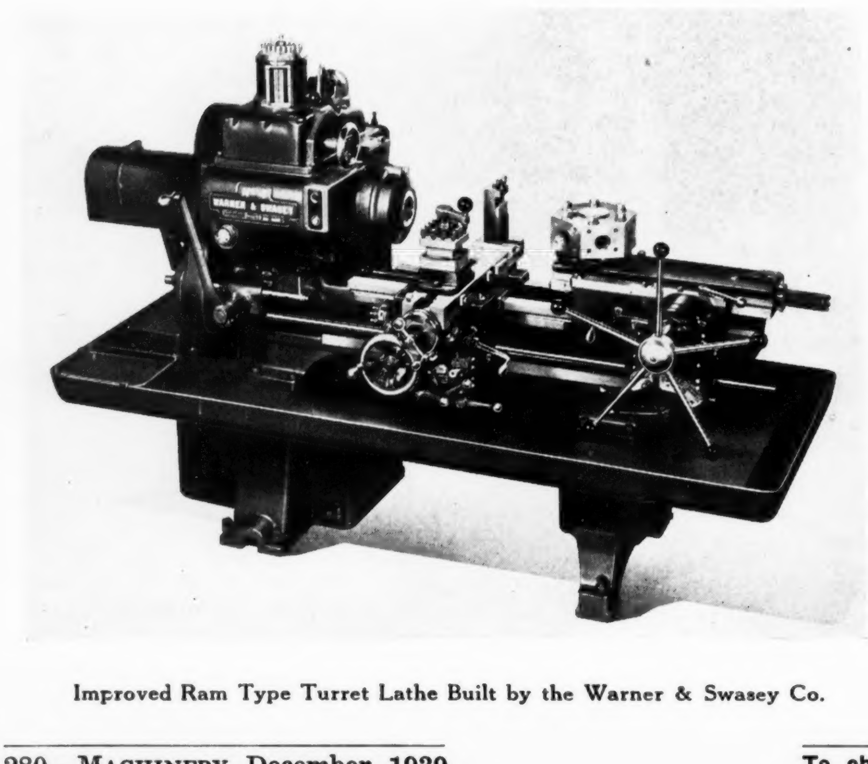
As the bed of this machine is a little more than twice the table length, there is no overhang of the table on maximum strokes. The housings are of massive pyramid construction, and are rigidly reinforced inside with thick vertical and horizontal walls. A machine of the same type as the one described is built with smaller milling heads, driven by 10-H.P. motors. 51

Warner & Swasey Ram Type Turret Lathe

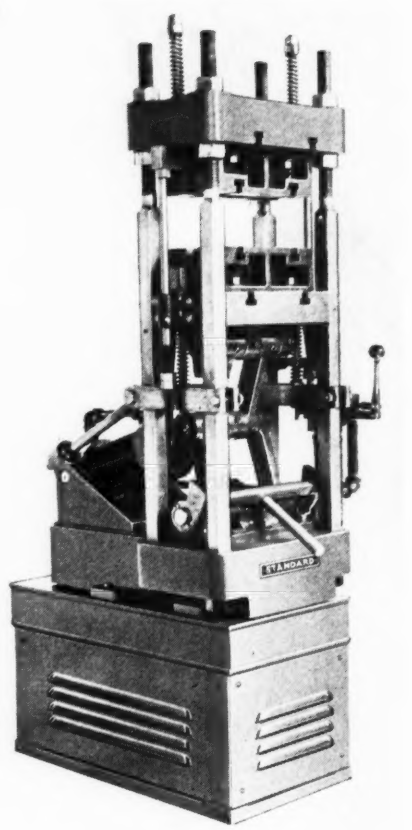
An improved No. 4 ram type turret lathe has recently been brought out by the Warner & Swasey Co., Cleveland, Ohio. Incorporated in the design of the new machine are many improvements, including a more rigid bed, a head brake, and an improved lubricating system for the head. This machine has a bar stock capacity of 2 inches, which is 1/4 inch larger than that of the No. 4 machine which it replaces. The chucking swing is 18 1/8 inches. It is equipped with the preselector head which previously has been available only as optional equipment. With this easily operated time-saving unit, only one lever is required for shifting the gears, and the cutting operations are placed on a complete surface feet per minute basis, which simplifies machining operations. The location of the shifter fork has been changed from the outside diameter of the gear teeth to a hub on the shaft in order to further simplify gear shifting.

The rigidity of the bed has been increased by new diagonal-rib construction. This not only maintains accuracy during extreme cutting conditions, but also increases considerably the clearance space for chips. The universal cross-slide has six reversible power feeds, in both cross and longitudinal directions. The square turret is indexed automatically, and the large cross-slide dial has widely spaced graduations for accurately measuring the depth of cut. A plunger oil-pump on the cross-slide lubricates both the cross-slide and the bed bearings.

The hexagon turret is equipped with adjustable stops for automatically tripping the feed for each turret face, and the turret can be indexed or spun in either direction to skip tool stations. Adjustable taper gibs at the top and sides of the turret-slides assure proper fit under all conditions, and the hexagon turret revolves on an adjustable taper roller-bearing center stud. Hardened replaceable plates are provided under the slide to resist wear. The motor and drive are completely enclosed in a cabinet leg directly under the head of the machine. Doors on both sides permit ready access to the motor. A multiple V-belt drive is provided as regular equipment. 52



Improved Ram Type Turret Lathe Built by the Warner & Swasey Co.



Twenty-ton Molding Press Made by Standard Machinery Co.

Twenty-Ton Plastics Molding Press

A new plastics molding press, built by the Standard Machinery Co. in a 20-ton model of similar design to the 50- to 300-ton presses of this company's manufacture, is being placed on the market by the F. J. Stokes Machine Co., Olney P.O., Philadelphia, Pa. This quick-acting, toggle type press is made in two models that are similar in capacity, stroke, opening between platens, etc.

One press is a self-contained, hydraulically operated unit with a motor and duplex pump in the base. The other is designed for air operation at a pressure of 125 pounds per square inch.

The 20-ton press is recommended for experimental purposes, as well as for all production work within its range. The opening speed is 80 inches per minute, and the closing speed 75 inches per minute. A single finger-operated lever starts the closing and opening movements, the press automatically completing each movement. Automatic time-cycle control can also be furnished, by means of which degassing, curing, and opening are all performed automatically, with accurate timing. 53

To obtain additional information on equipment described on this page, see lower part of page 278.

Seybold-Morrison Steel Stitching Machine

Seybold-Morrison Steel Stitcher

Stitching steel with the same advantages obtained in stitching paper or cardboard can be accomplished on a steel stitcher brought out by the Seybold Division, Harris-Seybold-Potter Co., Dayton, Ohio. With this new machine, stitches of steel can be driven through steel 0.06 inch thick. Machines like the one shown in the illustration are now being used in the automotive industry and in the construction of pre-fabricated houses, in the toy industry, and many other fields.

Fiber tacking strips can be quickly and permanently fastened to various sections of sheet-steel bodies, and rubber shields and anti-squeak material can also be firmly secured in place at low cost with this machine. Various materials having a total thickness up to 3/4 inch can also be fastened to sheet steel. Stitches can be driven within 3/8 inch of an upward rising flange, either front or back, and within 1/8 inch of downward projections. Minor variations in thickness of stock can be accommodated without adjusting the machine arm.

By simply turning a knob, either non-repeat or continuous stitching can be performed. If a hard grade of wire is used for the stitching, the wire acts as a punch, piercing out a slug from the metal being stitched. The machine is regularly made with an 8- or a 20-inch throat depth, but models with 25- and 30-inch throat depths are available. The machine is driven by a 1/4-H.P. motor.......54

General Electric Pyranol-Filled Capacitors

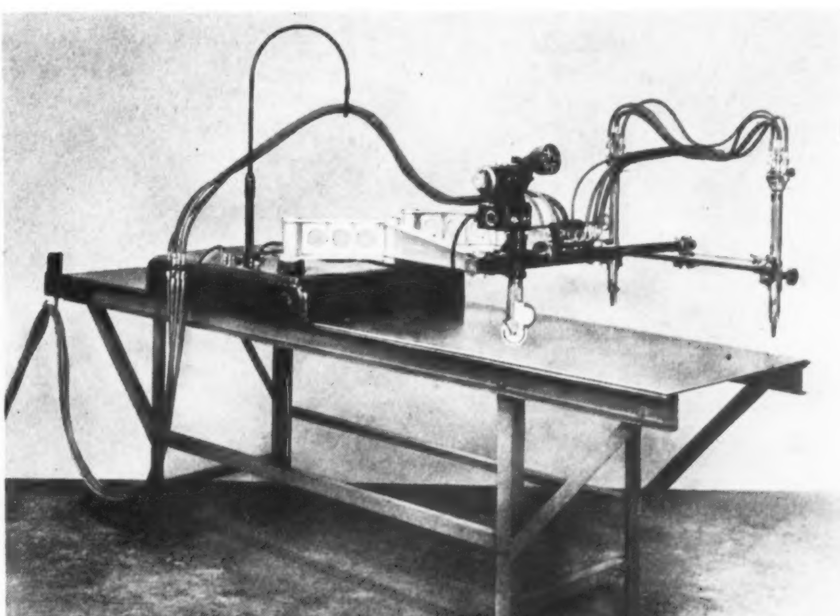
For power-factor improvement in industrial plants, the General Electric Co., Schenectady, N. Y., has developed a group of Pyranol capacitors designed to be mounted either on a platform, on the floor, or suspended from the ceiling. This capacitor equipment is built of all-welded sheet steel. While the bodies of the units are exposed to a stream of ventilating air, the bushings, buses, and fuses are enclosed in a dust-tight compartment, eliminating difficulties from dust and dirt. Conduit knockouts are provided on the top and both sides for ease in making connections. Switches can be mounted on pillars or walls when the units are suspended from the ceiling. 55

"Airco" Planograph Equipped with Two Metal-Cutting Gas Torches

Extreme flexibility of control which permits cutting straight lines, rectangles, circles, and irregular shapes from ferrous metal of any thickness within the practical limits of the cutting torch characterizes the new "Airco" No. 10 planograph brought out by the Air Reduction Sales Co., 60 E. 42nd St., New York City. The planograph consists of a tracing table upon which the carriage travels, together with torches and tracing devices, supported on the carriage.

The cutting range in single-torch operation is 24 inches wide by 72 inches long. This length can be increased indefinitely in multiples of 72 inches by utilizing additional tracing tables. When two torches, mounted on the regular operating bar, are used for simultaneous cutting, the cutting area for each torch is 12 inches wide by 72 inches long. Two circles, each up to 12 inches in diameter can also be cut with the torches mounted in this way. By using an auxiliary bar, the cutting area is increased to 24 by 24 inches.

The device for manual tracing can be locked so that it will travel in a straight line in any desired direction without guidance. The devices for magnetic and templet tracing can be quickly interchanged in the existing head. A switch is provided for forward and reverse motion, and the speed of the motor is governed by a graduated disk known as the "index speed control." The cutting speed in inches per minute is registered on the reversible tachometer. 56



Planograph Equipped with Two Metal-cutting Torches

To obtain additional information on equipment described on this page, see lower part of page 278.

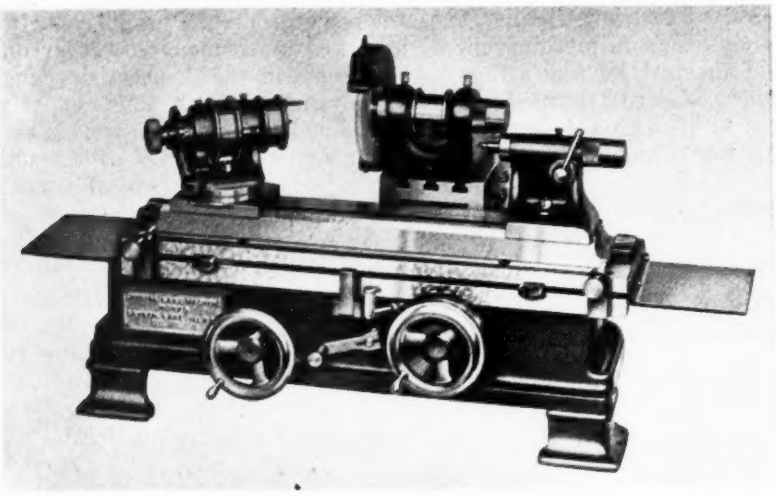


Fig. 1. Crystal Lake Universal Bench Grinder with Micrometer Stop

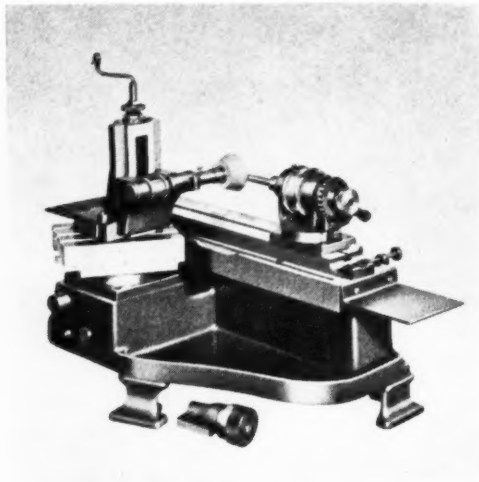


Fig. 2. Rear View of Grinder with Spline Grinding Attachment

Crystal Lake Universal Bench Grinder

A universal bench grinder for production, tool, and experimental work has been designed by the Crystal Lake Machine Works, Crystal Lake, Ill. This grinder is adapted for use in grinding circular tools; internal and external grinding operations on dies, gages, etc.; square, hexagonal, spline, punch, and cam grinding; the precision-grinding of screws, rollers, cams, shafts, parts of cameras and projectors, airplane engines, instruments, etc.; and the grinding of cutters, forming tools, reamers, and similar work.

The platen swings through a complete graduated circle, and can be clamped or released from either side. There are two speeds for the platen feed-wheel which give adjustments of 0.037 and 0.300 inch per turn of the handwheel. A micrometer stop on the platen for positive sizing gives direct reading on the dial to 0.0001 inch.

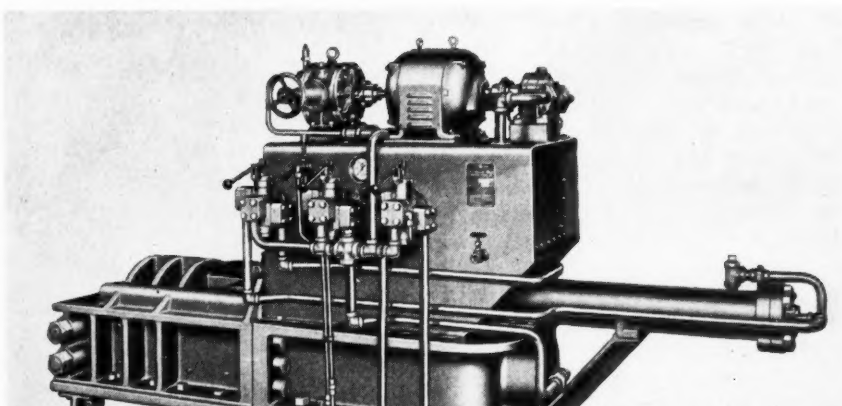
The table is 27 inches long, and has a working capacity of 8 by 10 inches. It has adjusting screws at both ends, and swivels on a hardened and ground center pin. There is sensitive adjustment of the platen for grinding tapers, one end being graduated to 1/2 degree. The feed dial is graduated to read to 0.0005 inch on the diameter of work.

The headstock is graduated to swing through a full circle. The machine has an 8-inch faceplate and a 4-inch, four-jaw chuck. The draw-in collet has a maximum capacity of 1/2 inch. The hole through the spindle is 9/16 inch in diameter. The headstock spindle is fitted with an index-plate having twenty-four divisions. There are four changes of work speed; the swing over the platen is 4 inches.

The internal grinding attachment has a speed of 17,500 R.P.M. A wheel chuck integral with the spindle takes mounted wheels having 1/8-inch shanks. The spline grinding attachment (Fig. 2) is especially useful for tool and die making. It can be driven at a speed of 5600 R.P.M. from the pulley on the motor. This attachment has a vertical adjustment of 4 inches from the center of the work-spindle, and can be set at any angle on the wheel-head platen. An overhead drive for a 1-H.P. double-shaft motor and pulleys is available.......57

H-P-M Scrap Metal Baling Press

The Hydraulic Press Mfg. Co., Mount Gilead, Ohio, has placed on the market a scrap metal baling press designed to compress trimmings, punchings, or similar scrap metal into bales of high density. After the press box of this machine has been filled with scrap, the sliding lid, which forms the top of the box, is closed by hydraulic pressure. As soon as the lid is completely closed, the preliminary pressing platen moves toward the end of the box. When this platen has reached the end of its travel, the side baling platen moves forward, compressing the scrap into the finished bale. The sliding lid is then opened, returning the first platen with it. The side platen is also returned to its initial starting position. A finished bale of exceptionally high density is then ejected from the box by a pneumatically operated ejector.



Scrap Metal Baling Press Built by the Hydraulic Press Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 278.

This baler requires but a minimum of space. There are no outside hydraulic pressure lines to be connected, the press being a complete unit with electric motor and hydraulic pumps. To put the machine in operation, it is only necessary to supply electricity for the motor, compressed air for the ejector, and water for cooling the operating oil. 58

G-E Variable-Voltage Drive for Planer

A new variable-voltage drive for reversing planers has been brought out by the General Electric Co., Schenectady, N. Y., which offers the advantages of a wide speed range, extremely fast acceleration and deceleration, high cutting efficiency, accuracy in stopping, and a very simple system of control. In addition, the equipment gives independent selection of cutting and return speeds throughout the entire speed range, together with a maximum number of strokes per minute on all stroke lengths.

Tests have shown that production increases ranging from 25 per cent up have been realized through the use of this new drive on modern planers. The drive consists of a direct-connected planer drive motor and an independent motor-generator set. As far as the control is concerned, a maximum of nine contactors and relays constitutes all operating devices on the control panel. Table speeds up to 240 feet per minute can be obtained by using suitable gear ratios in the planer. Both the rotating equipment and its control are designed to operate at low maintenance cost. 59

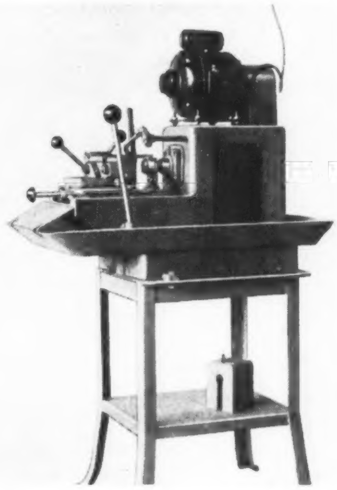


Fig. 1. Geometric No. 11 Bench Threading Machine

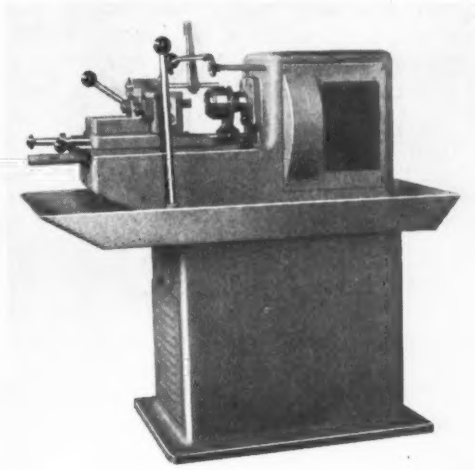


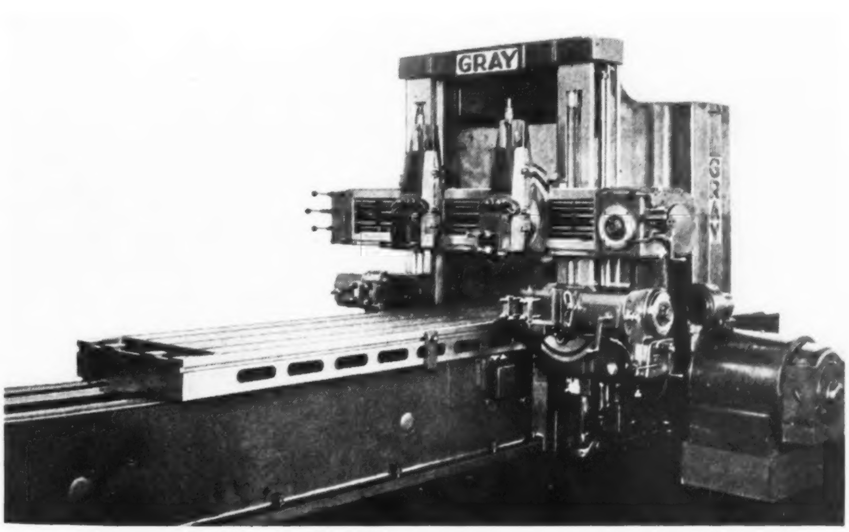
Fig. 2. Geometric Machine for Cutting Threads up to 1 1/2 Inches Diameter

Geometric Precision Threading Machines

The Geometric Tool Co., New Haven, Conn., has added two new machines to its line of threading equipment. The No. 11 bench type machine, shown in Fig. 1, is intended primarily for small-diameter fine-pitch threads up to 5/16 inch in diameter. This machine can also be used on finer pitches in sizes up to 9/16 inch in diameter. Either the Style KD Geometric rotary die-head using conventional milled or tapped chasers or the Style TR Geometric rotary die-head employing tangent or circular chasers can be used on this machine.

One of the outstanding features of this threading machine is the method provided for maintaining both vertical and horizontal alignment. Opposed adjusting screws, with an unusual pivoting arrangement of the carriage, enable the work-holder to be kept in accurate alignment with the die-spindle. This machine is designed for cutting Class 3 fit threads, and is provided with a standard vise which carries an automatic work-gage or stop that insures proper setting of the work. The drive-shaft is connected directly with the motor pulley by a V-belt. A pump of the reversing type supplies coolant either overhead or through the spindle by means of a two-way valve. This machine will cut threads up to 3 1/2 inches long when the work is held in a vise, and up to 5 5/8 inches long when held in a collet.

The No. 16 machine, shown in Fig. 2, will cut threads up to 1 inch in diameter in the National Coarse Thread Series, and up to 1 1/2 inches in diameter in fine-pitch threads. This machine is designed for the threading of duplicate parts where precision and quantity production are required. The maximum length of thread that can be cut is 5 3/4 inches when using a vise, and 9 inches when the work is held in a collet. 60



Reversing Planer Equipped with General Electric Variable-voltage Drive

Porous Bronze Retainers for Lubricating Fafnir Bearings

For specialized applications, the Fafnir Bearing Co., New Britain, Conn., is placing on the market a line of ball bearings with retainers made of oil-impregnated bronze. The new type of retainers used in these bearings holds and slowly feeds sufficient oil to lubricate the ball bearings throughout their lives, making the bearings thus equipped especially adapted for application in inaccessible locations or where they are

To obtain additional information on equipment described on this page, see lower part of page 278.

subjected to sub-zero temperatures. Test bearings of this kind put in operation in 1934 are still running without any addition of lubricant, although they have been in continuous operation, twenty-four hours a day, under varied speeds and loads. 61

Bakewell Precision Tapping Machines

A precision tapping machine designed for tapping on a production basis, to meet Class 3 gage requirements, has been placed on the market by the Bakewell Mfg. Co., 2427 E. 14th St., Los Angeles, Calif. This machine was originally developed to meet the builder's own requirements in the production of aircraft parts made from pure aluminum and aluminum alloys, bronze, die-castings, plastics, nickel steel, stainless steel, and chromium-molybdenum alloys with a tensile strength up to 180,000 pounds per square inch. Practically perfect threads of exact size can be tapped in these materials, because the tap is used as a cutting tool only and does not govern the lead.

This tapping machine is built in two sizes. The No. 1 machine, Fig. 1, has a capacity for 1/8- to 3/8-inch pipe threads in aluminum, fiber, plastics, and brass; 1/8- to 1/4-inch pipe threads in normalized nickel and chromium-molybdenum steels; 5/8-inch U.S. threads in aluminum, bronze, plastics, or soft materials; and up to 7/16-inch U.S. threads in mild steel.

The machine is driven by a 1/2-H.P. motor, giving a speed of 900 R.P.M. for tapping and a reversing speed of 1800 R.P.M. A hardened and ground lead-screw is attached to the spindle, as indicated in Fig. 2. An ingenious arrangement makes it possible to lead the tap in or out of the work, as there is no end play in the quick-change lead-screws.

The No. 2 tapping machine has all the features of the No. 1 machine. It has a capacity for tapping 3/8- to 2-inch pipe threads in aluminum, fiber, plastics, etc.; 3/8- to 1 1/4-inch pipe threads in steel, including nickel and chromium-alloy normalized steels; and 3/8- to 1 1/2-inch U.S. threads in nickel and chromium-molybdenum normalized steels. This machine has twelve spindle speeds ranging from 25 to 750 R.P.M. By operating a handwheel, the tap is brought close to the work; then, by depressing a foot-pedal, the tap is fed into the work at the correct rate of feed. When the tap reaches a predetermined depth, the motor is reversed automatically, the tap being backed out at a speed twice the tapping speed. 62

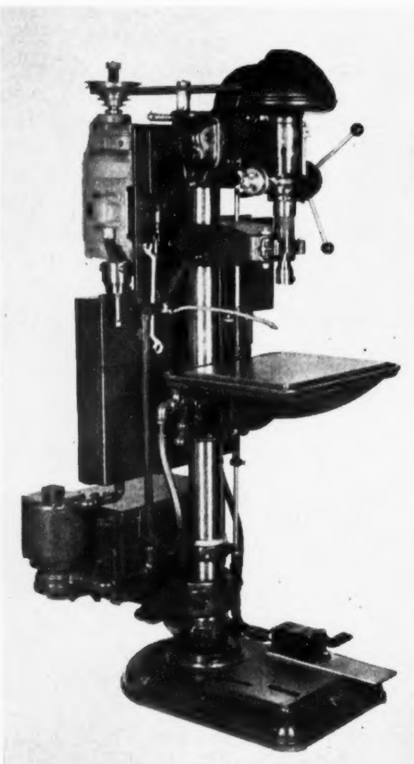


Fig. 1. Bakewell Precision Tapping Machine

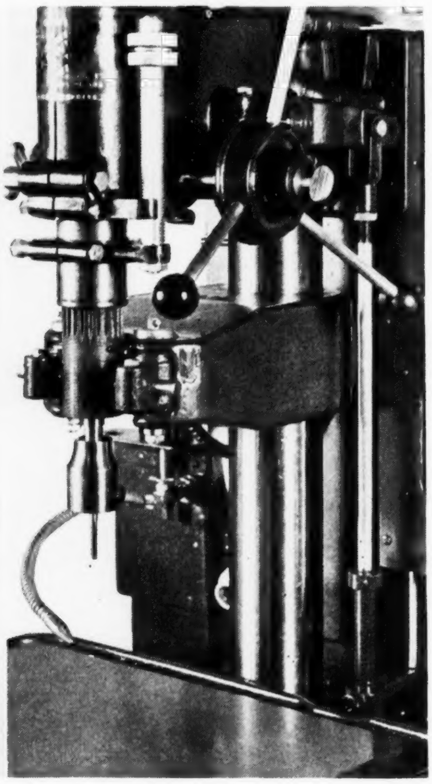
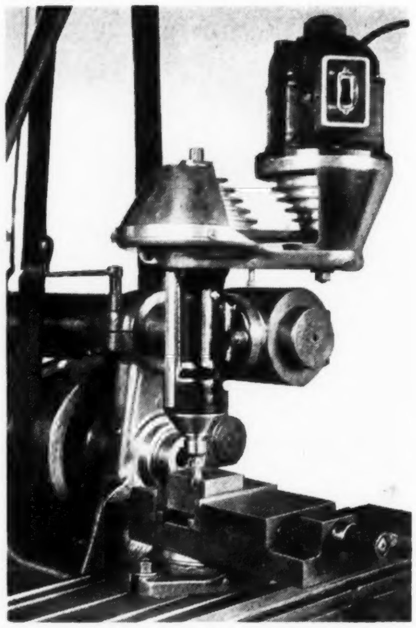


Fig. 2. Close-up View of Spindle of Tapping Machine



Motor-driven Milling Attachment Made by the Rusnok Tool Works

Rusnok Motor-Driven Milling Attachment

An all-duty high-speed motor-driven milling attachment manufactured by the Rusnok Tool Works, Chicago, Ill., is being placed on the market by Lockwin & Co., 205 W. Wacker Drive, Chicago, Ill. This attachment is designed to convert a horizontal milling machine into a universal milling machine. It will fit all around over-arm milling machines, and will operate at any angle. The attachment can be easily set for single or compound angle milling.

The 1/2-H.P. motor has a positive-action thermostatic switch. The spindle is equipped with 3-inch Timken precision roller bearings, and is built to use a No. 9 B & S taper-shank holder for end-mills or taper-shank end-mills of the draw-bar style. End-mills of smaller sizes of the straight-shank type can be used in the holders. Only two sizes of holders are required to accommodate the complete range of end-mill sizes from 1/16 to 3/4 inch in diameter.

This attachment has many applications in general manufacturing, mold making, and operations on blanking and forming dies, die-casting dies, wood and metal patterns, special tools, jigs, fixtures, etc. It can also be used for such operations as recessing tool shanks for Carboloy tips; surfacing mild steels and cast iron; boring large holes; keyslotting; fly cutting; and many types of operations with end-mills, slitting saws and small-angle cutters. 63

To obtain additional information on equipment described on this page, see lower part of page 278.

Reed-Prentice Keyseating Machine

The Reed-Prentice Corporation, Worcester, Mass., has brought out a keyseating machine adapted for toolroom work, such as machining keyways, slots, splines, recesses, etc., as well as for performing light, hand-fed, vertical milling operations. The table, saddle, and knee are provided with hand-feed in all directions. The spindle head has a horizontal reciprocating motion transmitted by an adjustable crank motion through a compensating device, providing a constant speed for the slide in both directions. By locking the reciprocating head, the machine can be used as a hand-operated milling machine.

The machine is driven by a two-speed vertically mounted 8-H.P. motor. Two spindle drives are provided by means of V-ropes; one drive provides six speeds from 290 to 2350 R.P.M. to the cutter-spindle, and the other, four rates of reciprocating travel to the spindle head for each spindle speed.

The maximum capacity for cutting keyways with the reciprocating automatic crank drive is 3/4 inch by 5 inches; by the use of the table adjustment, keyways 3/4 inch by 20 inches in length can be cut. The maximum depth keyway that can be cut automatically is 2 3/4 inches. 64

Keyseating Machine Brought out by Reed-Prentice Corporation

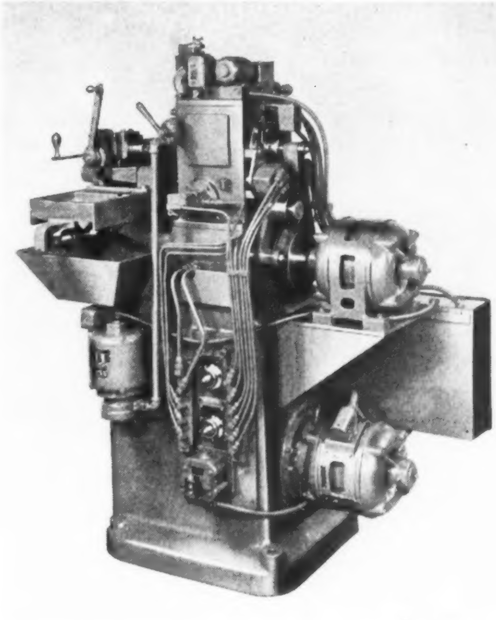


Fig. 1. LeMaire Machine Designed for Grinding Channels in Aircraft Engine Connecting-rods

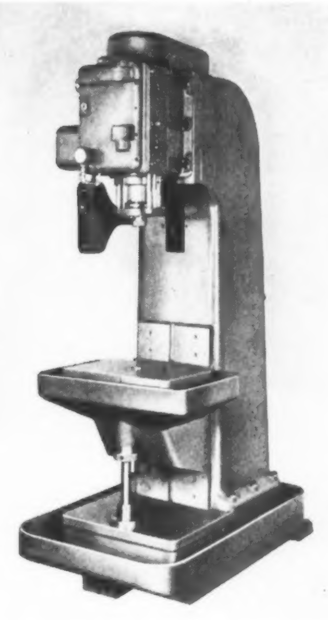


Fig. 2. LeMaire Vertical Drilling Machine with Hydraulic Feed

LeMaire Connecting-Rod Grinder and Vertical Drilling Machine

For grinding the channels in aircraft engine connecting-rods, the LeMaire Tool & Mfg. Co., Dearborn, Mich., has developed the machine shown in Fig. 1. This grinder is equipped with a quick-acting fixture in which the rods are located by previously ground bearing holes. One lever locks the work in the fixture; by a second lever the fixture is then turned over into a vertical position for grinding.

The channels to be ground have a radius at each end and also a radius connecting the side walls with the bottom of the channel. The latter radius is finished by a formed grinding wheel. An automatic wheel dresser produces the required contour on the diamond wheel. After the dresser has backed away, the grinding movement starts.

One complete cycle consists of a horizontal movement of the work-table, a vertical movement of the grinding head, a return horizontal movement of the work-table, and a return vertical movement of the grinding head. This carries the grinding wheel all the way around the side-walls and ends of the channel, grinding the radius between the walls and the bottom, as well as the bottom of the channel.

Each cycle removes 0.00025 inch of metal, forty cycles completing the operation. After the channel in one side has been ground, the connecting-rod is reversed on the fixture for finishing the opposite side. All movements, with the exception of the spindle rotation, are obtained hydraulically through an electric motor drive, the spindle drive being obtained by an electric motor through a fabric belt.

The No. 5 LeMaire vertical drilling machine with hydraulic feed, Fig. 2, is another new development. This machine has been designed for fast production, either single- or multiple-spindle drilling, boring, reaming, counterboring, hollow-milling, chamfering, and facing operations. It operates automatically by push-button control. The spindle power unit is contained in a housing mounted on the column, and is driven by V-belts from a motor in the column. Provision has been made for jump feed and delayed reverse movements. There is a hand-lever for obtaining fine feed and a push-rod for rapid feed. The table also has an accurately located center pilot hole for positioning fixtures or indexing tables.

The 3-H.P. motor has a speed of 1200 R.P.M. The drilling capacity is 1 inch in steel. Spindle speeds range from 300 to 3200 R.P.M. The traverse rate is 196 inches per minute forward, and 372 inches per minute in reverse. The feed rate ranges up to 163 inches per minute. The maximum stroke is 10 inches. 65

To obtain additional information on equipment described on this page, see lower part of page 278.

Bridgeport "Abrasaw" Wet Cut-off Machine

Bridgeport "Abrasaw" Cut-Off Machine

The Bridgeport Safety Emery Wheel Co., Inc., 1270 W. Broad St., Bridgeport, Conn., has just brought out a No. 47-W "Abrasaw" wet cut-off machine which is adapted for cutting light bars and structural shapes. This machine has a capacity for cutting 1-inch solid bars or tubing and light sections up to 2 inches. It has been developed as a companion machine for the company's larger No. 48-W cut-off machine, but is intended for lighter work.

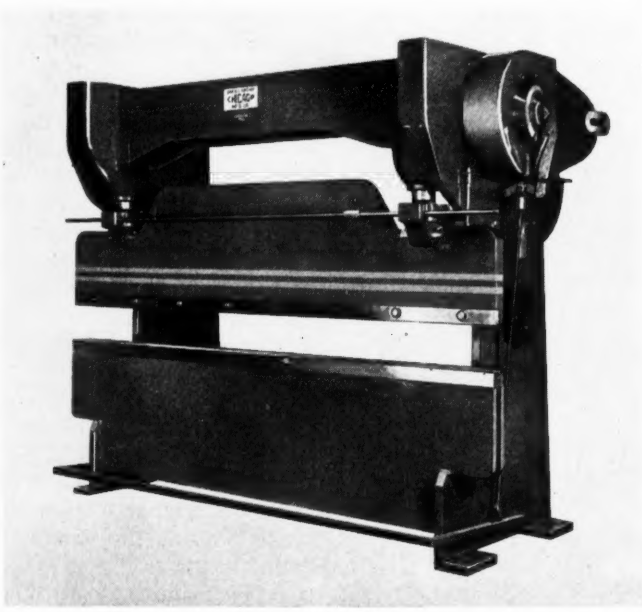
The 16-inch disk wheels used on the larger machine can be employed to advantage on the smaller machine after they have been reduced to their minimum usable diameter on the large machine. Pieces of cold rolled steel 1/4 inch in diameter can be cut off in one second, and a bar of SAE 1045 steel 1 inch in diameter can be cut off in ten seconds on this machine. 66

Chicago Crankless Steel Press Brake

A new press brake of all-steel construction for bending, forming, and punching sheet steel has been brought out by the Dreis & Krump Mfg. Co., 7400 S. Loomis Blvd., Chicago, Ill. New features of this machine include streamline design and a new type cushioned friction clutch. The press is of the crankless type, with compactly arranged gears and eccentrics enclosed and running in a bath of oil.

Power is delivered to both ends of the ram. The main bull gears and eccentrics are of one-piece construction. Double back-gearing is used to obtain smooth operation and reserve power. Adjusting screws are encased in sleeve-like plungers and operate in a vertical non-oscillating position throughout the stroke. The friction clutch has only one moving part, and requires practically no adjustment. The brake is combined with the clutch, both being operated by a simple movement.

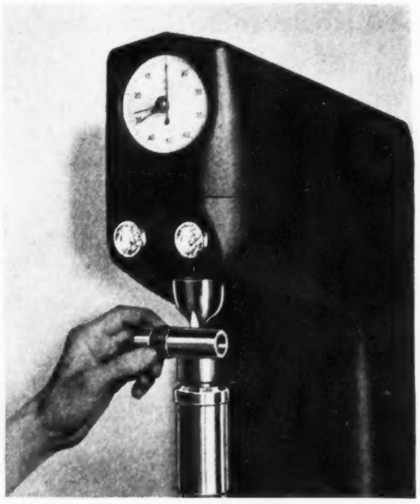
The variable-speed drive operates the ram at any speed from 15 to 45 strokes per minute. The three sizes in which the press brake is built have a capacity range for bending plate from 3/16 inch thick by 4 feet long up to 14-gage sheets 10 feet long. The stroke is 2 1/2 inches, the adjustment of the ram 3 inches, and the die space 6 1/2 inches. 67



Chicago Press Brake Brought out by Dreis & Krump Mfg. Co.

"Steeltest" Hardness Tester

A hardness tester known as the "Steeltest," in which new automatic features have been incorporated, has been introduced to the trade by the Modern Collet & Machine Co., 401 Salliotte St., Ecorse, Mich. This instrument is designed especially for volume hardness testing. It can be operated at three speeds, and is capable of making 1200 to 2700 accurate hardness tests per hour. Direct readings on the Steeltest give actual Rockwell and Brinell hardness numbers.



"Steeltest" Hardness Tester Made by Modern Collet & Machine Co.

The testing operation is almost entirely automatic, the only manual operations being the hand elevation of one specimen in each lot for the initial setting and the feeding of the specimens. The travel of the penetrator is fully automatic, and is synchronized with two flasher lights located directly below the indicating dial. One flasher light is green and signals the time to feed. The other light, which is red, shows the setting to be within the range of penetrator travel. When the instrument is running idle or when the specimen is not being tested properly, the red light appears. Power is supplied through a 1/15-H.P. Ratiomotor operating on 60-cycle, 110-volt, alternating current. 68

Adjustable Welding Table of Three-Ton Capacity

A Model 60 welding positioner having a capacity of 6000 pounds, which is supplied with an independent motor and control for both the table tilting and the table rotating movements, has been brought out by the Cullen-Friestedt Co., 1300 S. Kilbourn Ave., Chicago, Ill. The capacity of the table is based on having the center of gravity of the load 12 inches from the base of the table and 6 inches to the side of the axis of rotation.

To obtain additional information on equipment described on this page, see lower part of page 278.

Adjustable Welding Table Built by the Cullen-Friestedt Co.

Conway Disk Clutch Equipped with Overload Release

Electric Control Station Made by the Allen-Bradley Co.

The table can be rotated through a full circle, regardless of the angle at which it is tilted. It can be tilted through an arc of 135 degrees from the horizontal position. The gears for rotating and tilting the table are self-locking in all positions. The height of the table is adjustable from 42 to 54 inches on machines with standard bases, but machines can be furnished with special mountings of other heights for handling extremely large work. 69

Conway Disk Clutches with Overload Release

The Conway Clutch Co., 1543 Queen City Ave., Cincinnati, Ohio, has brought out a line of overload release disk clutches which are designed to function in transmitting power in a manner similar to that of a fuse in the transmission of electric current. Any clutch in this new line can be set to transmit any torque from zero up to its rated capacity, and to keep this setting even after adjustment for wear is made.

In operation, the clutch transmits the load smoothly until an obstruction or excessive torque is met with. It then immediately slips, and after slipping for one-half revolution, automatically disengages itself. If desired, the clutch can also be arranged to operate a limit switch and disconnect the electrical equipment.

The overload release disk clutches are made in tandem-plate models with power ratings from 2 H.P. at 100 R.P.M. up to 36 H.P. at 300 R.P.M. They are also made in single-plate types in power ratings from 1 H.P. at 100 R.P.M. up to 18 H.P. at 300 R.P.M. 70

Allen-Bradley Three-Button Control Station

A new three-button control station, attractively styled and designed for long life, has been placed on the market by the Allen-Bradley Co., 1331 S. First St., Milwaukee, Wis. The cover is regularly furnished in black, but can be provided in machine tool gray or in white. This station is available with various button markings, including "Forward-Reverse-Stop," "Raise-Lower-Stop," "Up-Down-Stop," and "Open-Close-Stop." It can be mounted in either a horizontal or a vertical position, and can also be provided with a bar for locking the "Stop" button in its open position. The maximum direct-current rating is 1 ampere at 115 volts, 0.5 ampere at 230 volts, and 0.25 ampere at 550 volts. The maximum alternating-current rating is 3 amperes at 110 to 550 volts. 71

Coulter Cartridge-Case Finishing Machine

A cartridge-case finishing machine that is automatic in all its operations except loading and unloading has been brought out by the James Coulter Machine Co., 386-404 Mountain Grove St., Bridgeport, Conn. This machine will finish 5-inch cartridge cases in twenty-five seconds. The facing, contour-turning, drilling, reaming, and counterboring, open-end trimming to length, and inside and outside chamfering operations are all controlled automatically. The machine is completely motor-driven, all motors having brakes to prevent loss of time through coasting at high speeds.

The cam feed-shaft is arranged for hand operation to facilitate tool adjustment. The loading requires only five to seven seconds. The complete operation consists of inserting the blank cartridge case in the air-operated collet chuck; starting the motors for the work-

Cartridge-case Finishing Machine Built by James Coulter Machine Co.

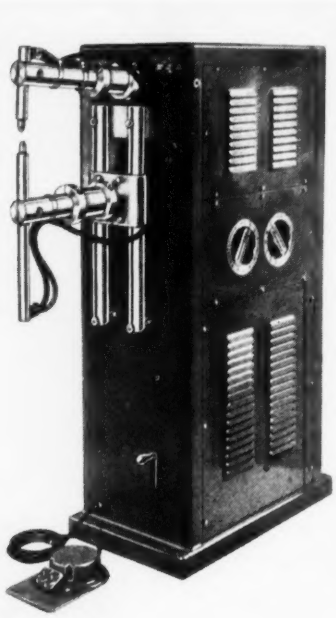
To obtain additional information on equipment described on this page, see lower part of page 278.

spindles and the automatic cam control shaft simultaneously; and removing the work. One revolution of the camshaft serves to complete the operations and stop the machine. 72

Pier Spot-Welders

The Pier Equipment Mfg. Co., Milton and Cross Sts., Benton Harbor, Mich., has added two new models to its line of Ace spot-welders. These new welders are designed for spot or projection welding, and with suitable fixtures, can be employed for butt welding. Both welders are of 50 KW size, one being a motor-driven automatically operated type, arranged as shown in the illustration, while the other is manually operated through a new swivel-jointed foot-treadle.

Refinements added to both machines include such features as a new recessed automatic trip control and timing adjustment. An eight-point heat regulating switch for adjusting secondary voltages and current, and a long-life 300-ampere contactor are furnished. Four throat depths are available, and the lower welding horn can be adjusted to provide spacing up to 15 inches. The transformers are regularly designed for operation on 220-volt 60-cycle circuits. 73



Pier Motor-driven 50-KW Spot-welder

"Autodraft" Portable Drawing Machine

A portable drawing machine, known as the "Autodraft," is a new product of the Eugene Dietzgen Co., 2425 Sheffield Ave., Chicago, Ill. This drawing machine fulfills the requirements of a drawing-board, T-square, triangle, scale, protractor, and paper clamps, arranged as one unit, about the size of a brief case and as easy to carry. The protractor L-square can be set at any angle from 0 to 360 degrees by simply loosening the Bakelite knob. The protractor is graduated in degrees. The drawing-board is made of strong, light-weight presswood in two sizes, one 9 by 12, and the other 12 by 18 inches. 74

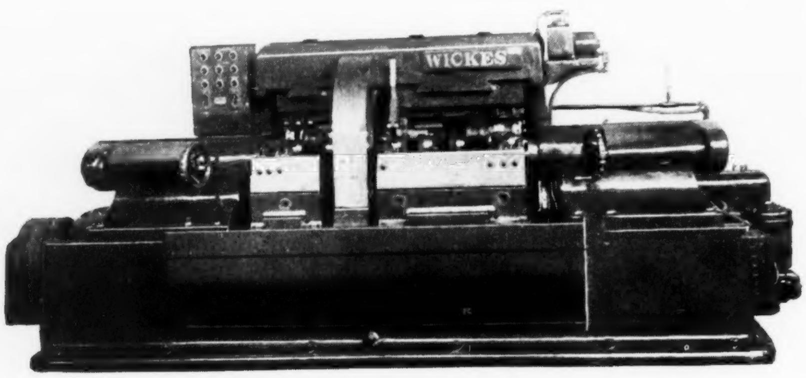
"Autodraft" Portable Drawing Machine Made by Eugene Dietzgen Co.

Wickes Hydraulically Operated Crankshaft Lathe with Center Drive

An extra heavy-duty, automatic, hydraulically operated, center-drive lathe especially designed for machining heavy airplane and Diesel type crankshafts has been added to the line of Wickes Bros., Saginaw, Mich. This machine, known as Model CH-8, is shown in the illustration provided with equipment for machining the Nos. 1, 4, and 7 main line bearings and both ends of a heavy airplane type crankshaft. A change in tooling adapts the lathe for machining the remaining main line bearings.

The lathe is operated entirely through electric push-buttons. Both the headstock and tailstock can be adjusted on the bed to accommodate crankshafts of different lengths. The rear tools are mounted on inverted cross-slides, which are carried in the back tool housing in order to withstand the upward thrust on the rear tool bits. The main drive is furnished by a 40-H.P. adjustable-speed direct-current motor through multiple V-belts to an enclosed gear-reducer. A separate 7 1/2-H.P. motor is used to drive the hydraulic unit.

Forced-feed lubrication is provided throughout. The center-drive gear is mounted on large taper roller bearings, and is totally enclosed in a housing to protect it from chips and dirt. A very large opening is provided in the center-drive gear in order to facilitate loading. 75



Wickes Crankshaft Lathe with Center Drive, Designed to Handle Heavy Airplane Engine Crankshafts

To obtain additional information on equipment described on this page, see lower part of page 278.

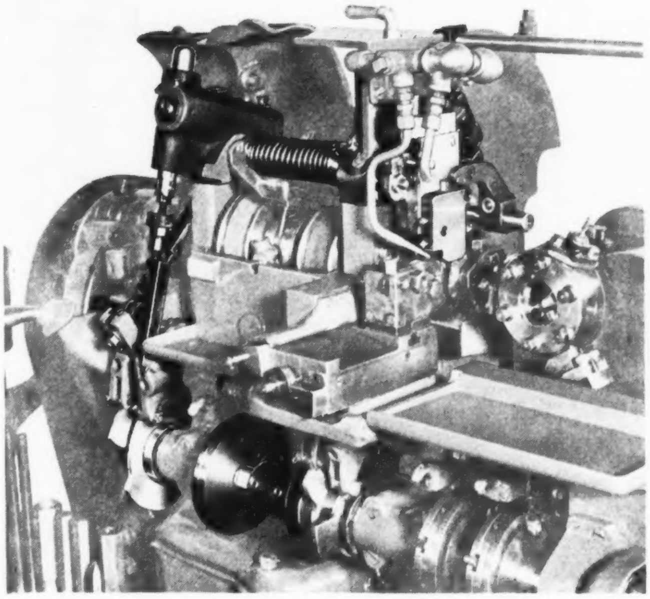


Fig. 1. Longitudinal Turning Attachment Installed on B & S Automatic Screw Machine

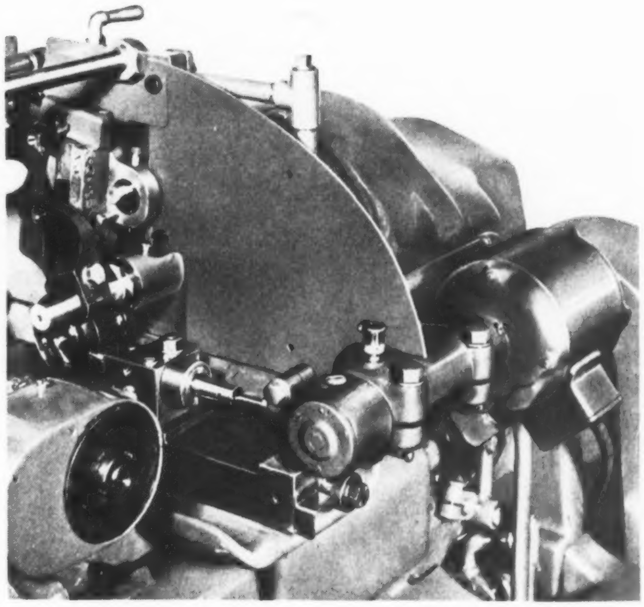


Fig. 2. Motor Drive for Cross-drilling Attachment Installed on B & S No. 0G Automatic

New Equipment for Brown & Sharpe Automatics

The Brown & Sharpe Mfg. Co., Providence, R. I., has just brought out a new longitudinal turning attachment for use on its Nos. 00 and 00G automatic screw, turret forming, cutting-off, and screw threading machines. This is essentially a vertical slide attachment provided with longitudinal movement, and is built for rapid turning. In addition to performing any vertical slide operation, it also will do straight turning to 1 inch in length. Turning is accomplished independently of other operations and with the spindle running in either direction. The vertical and longitudinal movements are both actuated by cams on the camshaft.

In Fig. 2 is shown a new motor drive for the cross-drilling attachments used on B & S Nos. 00G, 0G, and 2G high-speed automatic screw machines. The motor is attached by a bracket to the rear of the machine bed, and drives a pair of bevel gears at the end of the bracket through a flexible coupling and shaft.

The drill speed is 4950 R.P.M. for all sizes of machines. The motors are 1/4 H.P. for the No. 00G machine, and 1/2 H.P. for the Nos. 0G and 2G machines.

A new motor drive for turret drilling attachments used on B & S Nos. 00G, 0G, and 2G high-speed automatic screw and turret forming machines is shown in Fig. 3. This equipment includes everything necessary to drive by motor the drill-spindle assemblies of the turret drilling attachments. The motor is mounted on a bracket attached to the rear of the machine, and is connected to a keyed driving shaft by a flexible coupling. The drive furnishes drill speeds of 4550 R.P.M. for the No. 00G machine, 4050 R.P.M. for the No. 0G machine, and 4360 R.P.M. for the No. 2G machine. Since the drill rotates in the opposite direction

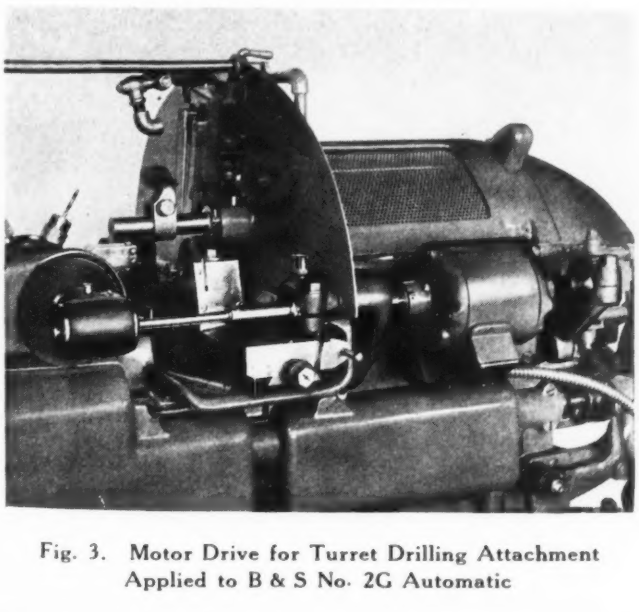


Fig. 3. Motor Drive for Turret Drilling Attachment Applied to B & S No. 2G Automatic

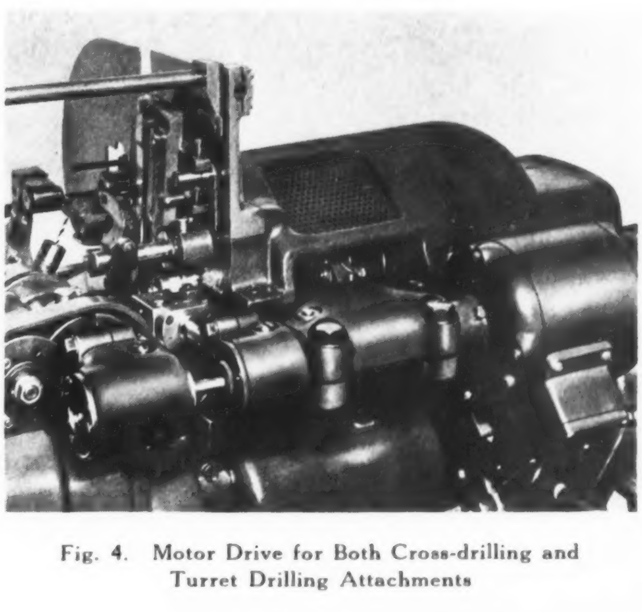


Fig. 4. Motor Drive for Both Cross-drilling and Turret Drilling Attachments

To obtain additional information on equipment described on this page, see lower part of page 278.

to that of the work, the cutting speed of the drill equals the drill speed plus the work speed. A 1/4-H.P. motor is employed for the No. 00G machine, and a 1/2-H.P. motor for the Nos. 0G and 2G machines.

Drill-spindle assemblies of both the cross-drilling and turret drilling attachments used on B & S Nos. 00G, 0G, and 2G high-speed automatic screw machines are driven by the same motor with the new B & S drive shown in Fig. 4. This motor drive equipment is essentially a combination of the individual motor drives for the cross-drilling and turret drilling attachments shown in Figs. 2 and 3. This drive provides turret drill speeds of 4550 R.P.M. for the No. 00G machine, 4050 R.P.M. for the No. 0G machine, and 4360 R.P.M. for the No. 2G machine. The cross drill speed of 4950 R.P.M. for all three sizes of machines must be added to the turret drill speeds to obtain the actual cutting speeds. A 1/3-H.P. motor is used for the No. 00G, and a 1/2-H.P. motor for the Nos. 0G and 2G machines. 76

Floor Type Honing Machine

The Honing Equipment Corporation, 4612 Woodward Ave., Detroit, Mich., has added to its line a low-priced honing machine for honing bores up to 2 inches in diameter by 5 inches long. The machine is known as Model MMVT, and can be supplied equipped as shown in the illustration. The new model has an adjustable work-table for small parts, and a work-table on the base for large pieces with small bores.

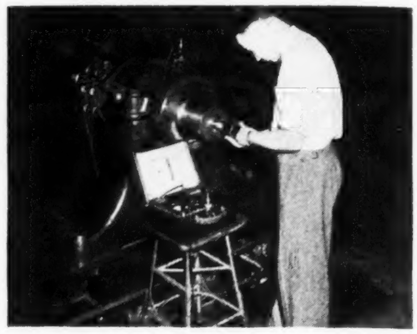
The head can be furnished mounted on a bench plate. Heads of this type can also be arranged in batteries of two or more on a work-bench or specially designed table. The drive is provided with four-step V-belt pulleys, giving four changes of speed to the rotating and reciprocating motions. The stroke is infinitely variable to suit the length of bore. A separate coolant system with pump, electric motor, filter, and reservoir can be provided. 77

Floor Type Honing Machine Made by the Honing Equipment Corporation

Bench Type Tool-sharpening Machine Made by K. O. Lee & Son Co.

K. O. Lee Reamer and Cutter Grinder

A new bench type complete tool-sharpening machine known as the "Knock-Out" universal grinder has been brought out by K. O. Lee & Son Co., Aberdeen, S. D. This grinder with its attachments has been developed for the rapid and accurate grinding of all types of milling cutters, end-mills, slotting cutters, keyway cutters, Carboloy tools, reamers and taps (with or without centers), hollow-mill blades, and circular saws up to and including 24 inches in diameter. An outstanding feature in the operation of this machine is the small amount of time required in making the various set-ups. 78



G-E Portable Dynamic Balancing Equipment

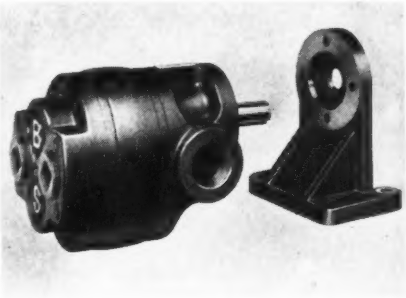
G-E Portable Dynamic Balancing Equipment

The General Electric Co., Schenectady, N. Y., has developed a portable dynamic balancing instrument for use wherever rotating machinery requires balancing to eliminate vibration. This new self-contained precision instrument is capable of measuring the amount and phase angle of unbalance vibration in the bearing pedestals of a rotating machine running in its own or substitute bearings at any speed between approximately 600 and 5000 R.P.M. Being portable, it permits balancing rotating equipment without removing the rotor from the machine, and balancing rotors that are too heavy for previously available portable machines.

One of the advantages of this equipment is that it can be used under all operating conditions. This makes very accurate balancing possible. The complete equipment, packed in a single case, consists of a sine-wave alternator, a vibration pick-up, and an instrument with its associated circuit on which mils displacement of the vibration are read.

In balancing any equipment, the sine-wave alternator spindle is inserted in a lathe center hole in either end of the rotor of the machine to be balanced, and the vibration pick-up is placed against the rotor bearing. The two voltages generated in the sine-wave alternator and vibration velocity unit are applied to the measuring instrument. The amount of vibration and the relative angular position of the high spots are then determined. This measurement is made with the machine in its original condition and also with two trial weights attached. From these measurements, calculations are made to determine the amount and location of the weights to be applied for correcting the unbalance. 79

To obtain additional information on equipment described on this page, see lower part of page 278.



Rotary Geared Pump with Flanged-stand Mounting Bracket

Brown & Sharpe Rotary Geared Pumps

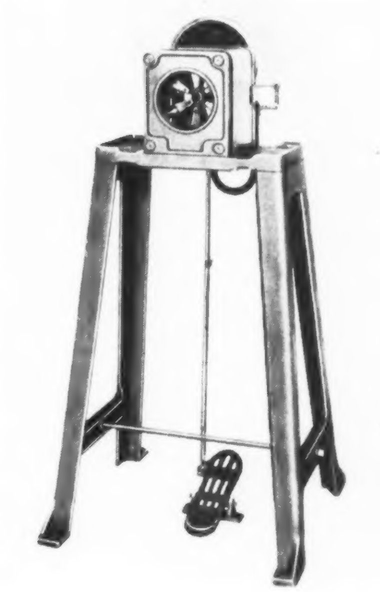
A new line of rotary geared pumps with herringbone gears, known as the 500 series, has been brought out by the Brown & Sharpe Mfg. Co., Providence, R. I. This line includes six sizes having capacities ranging from 5 to 37 gallons per minute. The pumps are designed to run quietly at high speeds under pressures up to 500 pounds per square inch. The speed characteristics of these pumps permit them to be direct motor-driven.

The pumps are of compact design, and the flanged stand with the separate, foot type, mounting bracket is designed to meet almost any installation requirements. The design also facilitates the assembling of duplex and motor-driven units. The pumps are hydraulically and mechanically balanced, and have interchangeable parts. Needle bearings, ground joints finished to assure accurate assembly, and reversible rotation are among the features incorporated in this line of pumps. 80

Multiple Hole-Piercing Machine

A multiple hole-piercing machine that will punch radial holes in tubes of paper, Bakelite, or similar materials, as well as in small zinc or aluminum cans and shields of the type commonly used in radio and associated fields, has been developed by the Automatic Mfg. Co., Inc., Harrison, N. J. Practically any number of holes within reasonable limitations can be punched in one operation. Tubes ranging from 3/8 inch to 2 inches inside diameter, with any wall thickness common to this type of material, can be pierced. The holes can be spaced in practically any position around the tube and for a length of approximately 6 inches.

With this machine, every tube is pierced accurately. The cost of tooling for each job is low; and after the initial tool equipment is completed, the change-over from one job to another can be accomplished in from five to thirty minutes. The construction of the machine makes it impossible for the operator's fingers to be placed under the punches. Production ranges from 1000 to 1600 pieces per hour. The complete machine, without motor and countershaft, weighs approximately 225 pounds. The machine is driven by a 1/4-H.P. motor, and can be equipped with a counter which registers automatically the number of pieces punched. 81

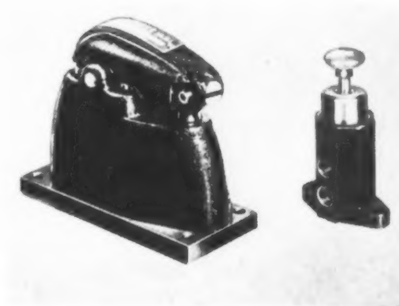


Multiple Hole-piercing Machine Built by the Automatic Mfg. Co.

Ross All-Air Pilot-Controlled Valve for Air Cylinders

The Ross Operating Valve Co., 6490 Epworth Blvd., Detroit, Mich., has added to its line a new all-air, pilot-controlled valve, designed for semi-automatic control, full automatic control, or remote control of double-acting air cylinders. The new equipment is designed especially for use where a series of successive operations demand rapid and accurately timed progressive movements, such as are required for spot- or seam-welding of automobile body parts or similar production work.

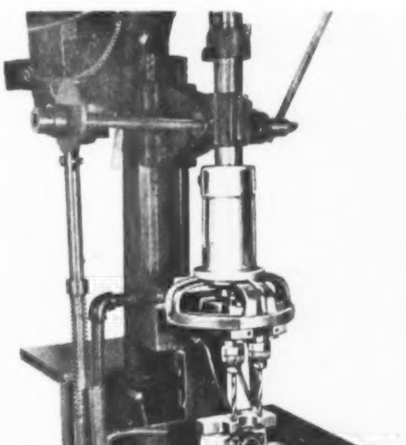
The valve is fully air-operated, and is actuated by pilot controls. These pilots are made in various designs to meet the immediate control requirements for hand, foot, or mechanical operation. 82



All-air Valve and Control Pilot Made by Ross Operating Valve Co.

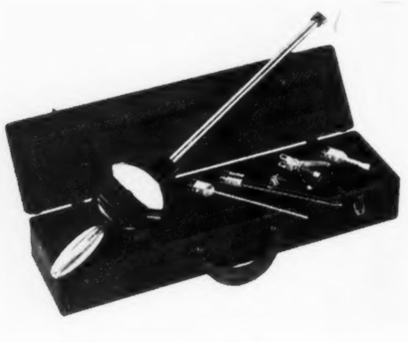
Two-Spindle Adjustable Drilling Head for Small Drill Presses

The Linderme Machine & Tool Co., Inc., 12241 Coyle Ave., Detroit, Mich., has just placed on the market a recently patented two-spindle, quick-set, adjustable drilling head. Adjustment of the two spindles to the desired drilling centers within a range of 7/8 inch to 6 inches can be accomplished by simply turning two hexagonal nuts. This drilling head is recommended for drills in sizes up to 1/2 inch. Although especially suited for small drill presses, it can also be used on large machines. It can be used for tapping operations as well. 83



Adjustable Drilling Head Made by Linderme Machine & Tool Co.

To obtain additional information on equipment described on this page, see lower part of page 278.



Surface Temperature Pyrometer and Four Types of Thermo-couples

Wheelco Surface Temperature Pyrometer

A new light-weight temperature pyrometer, designed for fast and accurate action, as well as to withstand rough usage, has been brought out by the Wheelco Instruments Co., 1929-1933 S. Halsted St., Chicago, Ill. This pyrometer has a swivel fan-shaped dial, flexible adjustable thermo-couple joint, and interchangeable thermo-couples. The handle can be attached to either the bottom or back of the instrument. This pyrometer can be used wherever a correct surface temperature reading up to 1200 degrees F. is required. The assortment of thermo-couples covers plastic, as well as solid materials......84

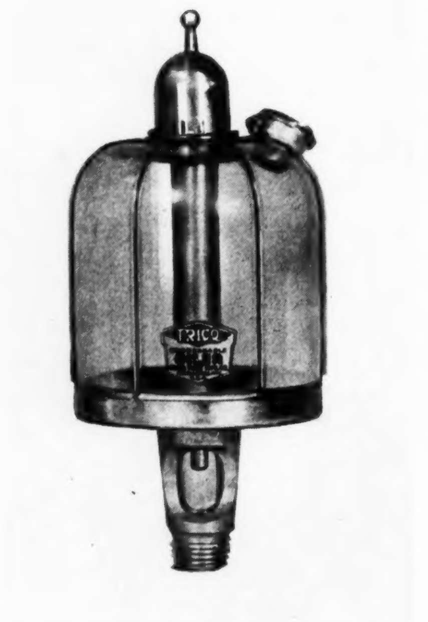
Oxweld Nozzles for Precision Oxy-Acetylene Cutting

Precision oxy-acetylene cutting nozzles, capable of making smooth cuts that require no subsequent machining for many types of work, have been developed by The Linde Air Products Co., 30 E. 42nd St., New York City. The cutting oxygen

Precision Oxy-acetylene Cutting Nozzles Developed by The Linde Air Products Co.

passage in these new nozzles is highly polished to insure a smooth flow of gas without deflection or turbulence. This is said to result in a clean smooth-faced cut.

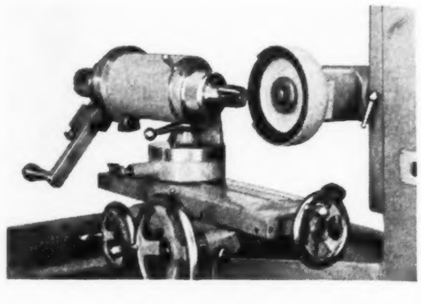
The preheat holes are smaller and are spread over a larger circle than in previous models, so that the heat is less concentrated in the line of cut, resulting in a cleaner, sharper upper edge, a smaller kerf and a saving in preheating gases. The cutting oxygen passage is located in a vertical position when the blowpipe is held upright, so that in cutting shapes or circles, the face of the cut will be true all around......85



Trico Gravity-feed Oiler with Unbreakable Reservoir

Trico Unbreakable Gravity-Feed Oiler

A new line of visible gravity-feed oilers of streamline design with unbreakable reservoirs has been developed by the Trico Fuse Mfg. Co., Milwaukee, Wis. This oiler is made in four sizes with capacities of 1, 2, 4, and 8 ounces. It is mounted at the top of the part to be lubricated and can be adjusted to give any predetermined number of drops of oil per minute by a simple ratchet control. After the adjustment has been made, no further attention is required except to keep a reserve supply of oil in the reservoir. The shut-off lever at the top, when in a vertical position, as illustrated, feeds oil, and when tilted to the side, stops the flow......86



Bergram Tap-relieving Attachment Mounted on Utility Grinder

Tap-Relieving Attachment for Bergram Utility Grinders

A tap-relief grinding head (Type RG-1) has been brought out by the Bergram Mechanical Engineering Co., Inc., New Britain, Conn. The attachment is shown mounted on a Bergram Utility grinder in the illustration. Either a cup or a plain type wheel can be used. This tap-relieving head will relieve the ends of flutes at any selected angle by eccentric setting. Collets for holding the taps are available in diameters up to 1 3/8 inches.

The grinding stops are adjustable for right- or left-hand taps. Three interchangeable index-plates are supplied with the attachment. These plates have 5, 7, and 24 index notches, and can be used for any number of flutes from 2 to 8, inclusive......87

Delta Shaper for Forming Moldings

The Delta Mfg. Co., 671 E. Vienna Ave., Milwaukee, Wis., has developed a low-cost machine for shaping,

Delta Molding-forming Machine Designed to Handle Wide Range of Work

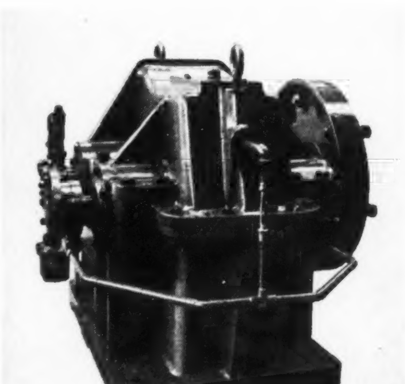
To obtain additional information on equipment described on this page, see lower part of page 278.

forming, or molding any type of woodwork from the smallest moldings to heavy production work. This machine is equipped with a spindle that is provided with sufficient lubricant for the life of the machine. The spindle is 3 1/4 inches long by 3/4 inch in diameter, and has a full 3-inch travel. It can be instantly replaced with a 1/2- or 5/16-inch spindle. The table measures 27 by 28 inches. Two tables can be bolted together, back to back, to form a two-spindle machine for production work. 88

Westinghouse Speed Increasers

A new line of speed increasers for operating centrifugal pumps, high-speed blowers, compressors, and pipeline equipment has been placed on the market by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These units are made in ratings of from 1 H.P. per 1000 R.P.M. of the high-speed shaft to more than 1800 H.P. per 1000 R.P.M., and with standard gear ratios varying from 2 to 1 up to 12 to 1. They can be supplied for either right- or left-hand assembly. The sleeve bearings have been designed with a view to providing low unit pressures and assuring permanent alignment with minimum friction losses.

Lubrication is accomplished by a self-contained circulating oil system. The gears are spray-lubricated at the line of contact, and all bearings are under pressure lubrication. The frames are split horizontally to permit easy access to internal parts, and each unit has a removable inspection plate. 89



Westinghouse Speed Increaser for Operating Centrifugal Pumps and High-speed Blowers

VibraSeal Pipe and Tube Connections

A new method of connecting copper, aluminum, and steel tubing to pipe-threaded tapped holes has been developed by the VibraSeal Corporation, 2832 E. Grand Blvd., Detroit, Mich. The new method is said to protect the tubing against fatigue and failures and to reduce vibration, noise, and heat flow. It requires no flaring of the tubing, and absorbs vibration strains which commonly cause tube breakage. This method is employed on industrial applications to eliminate vibration at the connections to oil supply lines, cutting compound tanks, and air compressors. This type of connection is sold at present in sizes to accommodate a range of tubes from 1/8 inch to 2 inches outside diameter. 90

"VibraSeal" Pipe Connection Designed to Eliminate Vibration and Noise

Speedway Portable Bench Grinder

A low-priced portable bench grinder with a streamline cast housing is a new product of the Speedway Mfg. Co., 1834 S. 52nd Ave., Cicero, Ill. This small-size grinder is adapted for sharpening drills, hand-tools, and cutter bits, as well as for industrial grinding jobs. It can be plugged into any 110-volt, alternating-current electric outlet.

Portable Bench Grinder Made by Speedway Mfg. Co.

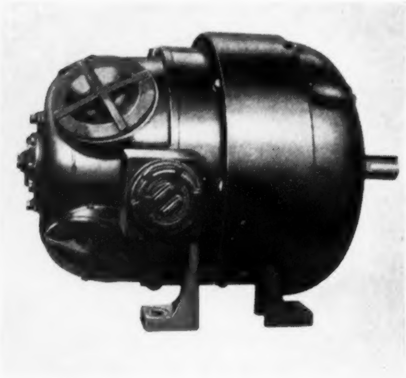
The motor and wheels are completely covered, except at the working points. Rubber feet serve to deaden noise and give a non-slipping base. Cast-in ears are provided for permanent installation. The rigid tool-rest slides in or out to give the desired tool angle or to compensate for wheel wear. 91

Polishing and Buffing Lathe

A Model MOS polishing and buffing lathe, available in horsepower ratings up to and including 10 H.P., with spindle diameters and wheel and spindle revolutions per minute to suit customer's specifications, has been brought out by the Rome Machinery Sales & Engineering Co., 627-35 Webster St., Rome, N. Y. Each spindle end of this lathe is tapped and counterbored to permit the assembly of taper-point attachments. Various accessories, including taper screw points; variable-speed spindle drive; start, stop, and brake lever control for the spindle; dust hoods with mounting brackets; and composition applicators can be supplied if desired. 92

Polishing and Buffing Lathe of 5 H.P. Rating, Made by the Rome Machinery Sales & Engineering Co.

To obtain additional information on equipment described on this page, see lower part of page 278.



Reliance Explosion-proof Motor of Improved Design

Reliance Explosion-Proof Motors

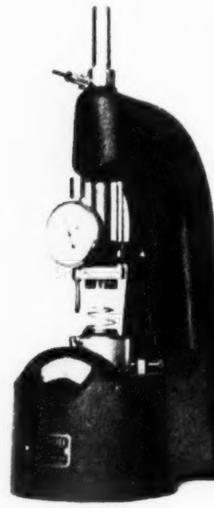
The fan-cooled, enclosed type, ball-bearing, direct-current motors developed over a period of years in the smaller sizes down to 1 H.P. by the Reliance Electric & Engineering Co., 1088 Ivanhoe Road, Cleveland, Ohio, have recently undergone changes and improvements. The improved line now includes explosion-proof motors in a complete range of sizes from 1 up to 75 H.P.

All these motors are designed to operate safely in the presence of gases and vapors such as those produced by methane, acetone, benzine, the various alcohols, common pyroxylin solvents and the vapors of various petroleum distillates, including gasoline. They are tested and approved for Class 1, Group D hazardous locations by the Underwriters Laboratories, Inc. 93

Spring Checker for Compression Springs

A compression spring tester with a 6-inch vertical height scale graduated to 1/32 inch for the indication of compressed height and with interchangeable units for load capacities of 10, 50, and 250 pounds, has been developed by the Link Engineering & Mfg. Co., 1054 W. Baltimore Ave., Detroit, Mich. The three load-capacity units have the load dial graduated to 1/2 ounce, 2 ounces, and 8 ounces, respectively. The checker will handle compression springs having a free height of 6 inches and a diameter of 2 5/8 inches. The distance from the center of the table to the column is 4 5/16 inches. The height of the tester is 19 inches, and the weight about 50 pounds.

The dial indicator is adapted for checking springs with close height tolerances. For large quantities of springs, a "Heightrol" is available which makes an electrical contact circuit that gives a buzzer signal when the preset height stylus makes contact with the spring. For checkng smaller tension springs, a bridge may be fitted to the table. This tester



Link Checker for Testing Load and Compression Capacities of Springs

is accurate enough for precision laboratory use and rugged enough for production inspection. 94

Stanley Diamond Wheel-Dresser for Contour Grinder

A diamond wheel-dresser, designated No. 155, has been brought out by the Stanley Electric Tool Divi-

Stanley Diamond Wheel-dresser in Position on Contour Grinder

sion, Stanley Works, New Britain, Conn., for use with the contour grinder made by this company. This dresser is designed to provide an inexpensive truing and dressing device for grinding wheels or points. A ring on the bottom of the dresser fits into a counterbored hole on the top of the grinder table. A large knurled screw is provided for setting the dresser, and a small knurled screw for setting the diamond accurately and regulating the depth of cut. 95

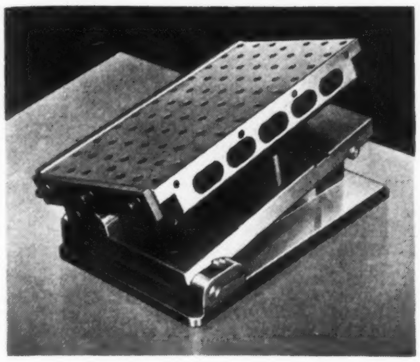
Ajusto-Spede" Alternating-Current Motor

An alternating-current motor, which through the combination of an eddy current clutch and a standard constant-speed alternating-current squirrel-cage motor, provides an adjustable range of speeds has been placed on the market by the Louis Allis Co., Milwaukee, Wis. In this "Ajusto-Spede" motor, there is no mechanical contact between the driving and driven members. Speed and torque variations are obtained by controlling the magnetic excitation of the clutch, thereby obtaining any desired slip.

Either a gradual or a quick acceleration of the load, rapid intermittent starting and disconnecting of the load, and the absorption of torsional impulses and vibrations are some of the functions performed by this unit without jar or shock on any of the driven parts. A speed variation from zero to the full speed at full load torque is available and the unit can be operated continually at low speeds. 96

Adjustable-speed Alternating-current Motor Recently Brought out by the Louis Allis Co.

To obtain additional information on equipment described on this page, see lower part of page 278.



Robbins Non-magnetic Sine Plate for Checking Angular Work

Robbins Non-Magnetic Sine Plate

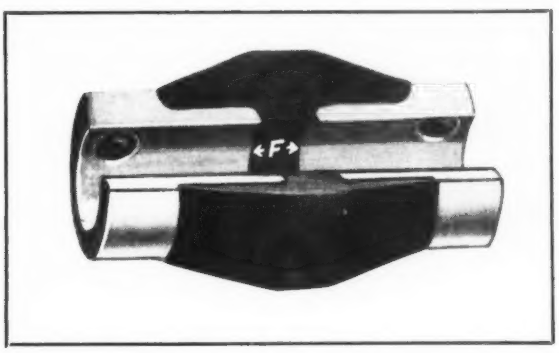
The Robbins Engineering Co., 635 Mount Elliott Ave., Detroit, Mich., has recently developed a new non-magnetic sine plate to supplement its Magna-Sine line. This sine plate is intended to be used only in inspection departments for accurate checking of angular machine work. The device utilizes standard gage-blocks for adjusting the plate to the angle or combination of angles required.

It is available in the same sizes and is manufactured to the same precision limits as the Magna-Sine. Its construction is of oil-hardening steel. Compound and single angle types are furnished. 97

Lord Bonded Rubber Flexible Coupling

A line of fractional-horsepower couplings designed to take care of both parallel and angular misalignment and to absorb torsional vibration is now being produced by the Lord Mfg. Co., Erie, Pa. These couplings prevent the transfer of gear noise and motor hum through the driven shaft.

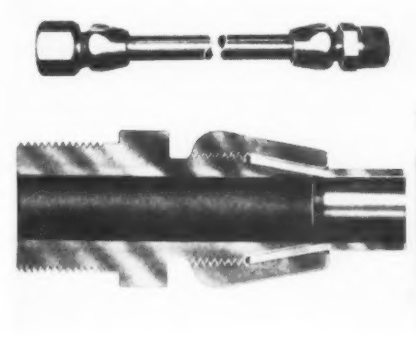
The couplings are made in sizes from 1/16 up to 1 H.P., and as complete units without any loose parts. 98



Construction of the Lord Bonded Rubber Flexible Coupling

"Superseal" Tubing Connectors

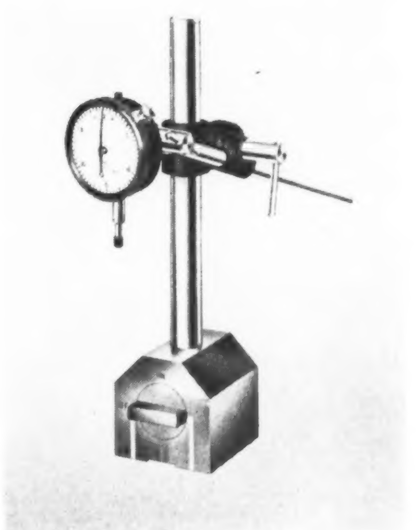
The Superseal Corporation, 300 Fourth Ave., New York City, has brought out a connector or joint of the design shown in the accompanying illustration for use with aluminum, brass, copper, and steel tubing. These connectors are available in sizes ranging from 1/8 inch to 2 inches for various applications, and in a wide range of lengths. The cut-away view shows clearly how the tubing, flared to a 20-degree angle, is sealed both inside and outside by tightening the compression nut on the fitting. 99



General and Cut-away Views of "Superseal" Tubing Connector

Brown & Sharpe Dial Test Indicators with Magnetic Bases

Two new dial test indicators designated Nos. 744 and 744A, which are equipped with magnetic bases by means of which they can be held in upside down and other positions, have been brought out by the Brown & Sharpe Mfg. Co., Providence, R. I., for sale only in the United States and its territories. These indicators can be secured firmly to the face of a machine column or to small surfaces that would not support a regular dial test indicator base.



Brown & Sharpe Indicator with Magnetic Base

By simply turning the control to the position marked "on," the magnetic base is held securely to any flat surface of iron or steel. With the control turned to the "off" position, the base is immediately released. The permanent magnet in the base is made of a special alloy designed to retain its magnetism indefinitely.

The bases of these dial test indicators are simple in construction, having only one moving part. They are designed along lines similar to those of permanent-magnet type chucks which require no electrical connections. 100

* * *

Machine Tool Sales in South America

Andre Haydu, manager of Alnorma Soc. Machinas Ltd., Rio de Janeiro, one of the largest machinery selling concerns in Brazil, is at present in the United States, the purpose of his visit being to purchase machinery and to seek new connections for his firm. The company has extensive showrooms both in Rio de Janeiro and in Sao Paulo, and employs a staff of high-grade technicians and salesmen, especially trained to serve the machine tool trade. An American firm known as the Alnameric Machinery Corporation has been established at 21 State St., New York, with J. Cremonin in charge. This company will represent the Alnorma Soc. Machinas Ltd. in the United States and will purchase machinery and conclude business arrangements for the South American firm. These two organizations will be able to simplify the problems of American manufacturers in selling machine tools to Brazil.

To obtain additional information on equipment described on this page, see lower part of page 278.

Inside of Cylinders and Bores Hardened by New Electric Method

A NEW method of heat-treating metals by electrical induction which makes possible the hardening of the inside of cylinders and other bores has been developed by Budd Induction Heating, Inc., a subsidiary of the Budd Wheel Co., Philadelphia, Pa. The process, which already is being utilized in production work at the Budd Detroit plant, makes possible the heat-treatment of the inside of bores from 2 inches in diameter up, and in practically any commercial lengths. The area treated, the depth of the treatment, and the degree of hardness developed can be controlled within exceedingly close limits. The operation is performed very rapidly.

In hardening the inside of cylinders, or bores of considerable length, such as engine cylinders, a retracting type head is used to heat the material by electrical induction. The head is moved at an even speed through the cylinder, the heating being followed by a water quench.

On one of the machines now in regular operation, the bores of automobile hub forgings are being hardened, thus making the roller-bearing race an integral part of the hub. In this application, the treated area is brought to a hardness of from 58 to 64 Rockwell C. Nearly two million pieces have been turned out on these machines during the last three years without a single failure.

Because of the high speed of heating and the fact that only the area and depth to be hardened are subjected to heat, distortion is held to a minimum. Annealing or normalizing treatments are seldom required for parts hardened by the new process.

The success of an operation such as that of hardening the inside of hub forgings, which requires exceedingly accurate control of area, depth, and hardness of the treated area, has led to the further development of the process for bores varying considerably in size and length. It is anticipated that the process will find wide use. It can be used to advantage, according to metallurgists who have closely observed the process, for the cylinder bores of Diesel, gasoline, and steam engines; for the sleeves used in sleeve-valve internal combustion engines; and for oil-well casings. Many other applications are under consideration.

Automobile Hub in Place in the Induction Heat-treating Machine, just after the Hardening Operation has been Completed. The Head of the Machine has been Lowered into the Bore, Bringing the Surface of the Bore to a High Temperature by Means of Electrical Induction, and then Withdrawn as Water is Forced at High Pressure Through a Quenching Fixture. The Whole Procedure Takes Only a Few Seconds.

The equipment built so far is applicable to diameters from 2 to 7 1/2 inches and to lengths up to 30 inches, but equipment can be provided to handle a wider range of sizes. Since the development work is now completed and the process tested in production, its application to sizes other than those so far handled will require only the adoption of known principles in the design of larger equipment.

The Budd Wheel Co. is in a position to undertake the design and production of finished parts with bores hardened by the new process, and to heat-treat the bores of cylinders and other parts shipped to the company for hardening.

* * *

Tax Burden of the Railroads

The taxes paid by the railroads in the United States in 1938 amounted to $340,782,000. This is considerably more than double the taxes paid in 1916, when this figure was $157,113,000. Taxes take 9 1/2 per cent of the entire gross operating revenue of the railroads. In other words, out of every dollar received by the railroads, the local, state, and federal tax collectors take about ten cents. Furthermore, the taxes paid by the railroads in 1938 were almost equal to the total net operating income. In that year, the railways in the country as a whole earned but 1.43 per cent on their aggregate property investment. The dividends paid out to the stockholders totalled less than one-fourth of the amount the railroads paid to the Government in taxes. In other words, for every 25 cents that the owners of the railroads received for having supplied the capital with which to build, equip, and start to operate them, the Government took a full dollar—for what?

NEWS OF THE INDUSTRY

Canada

JAMES L. ASHLEY, secretary and treasurer of the International Nickel Co. of Canada, Ltd., who has been an executive since the formation of the original International Nickel Co. in 1902, has retired under the company's Retirement System, but will continue to serve in an advisory capacity for some time. He will also remain a director of the International Nickel Co. of Canada, Ltd., and its various subsidiaries.

Mr. Ashley has been treasurer of the company since 1902 and has served as secretary since 1911. WILLIAM J. HUTCHINSON has been elected to succeed Mr. Ashley as treasurer, and has also become a director. HENRY S. WINGATE, assistant to the president of the International Nickel Co., Inc., was elected secretary of the parent company.

Michigan and Wisconsin

MECHANICAL HANDLING SYSTEMS, INC., Detroit, Mich., manufacturers of conveyors and allied materials-handling equipment, have appointed the following engineering-sales concerns to represent the company in the East: WONHAM, INC., 44 Whitehall St., New York City, for Connecticut, northern New Jersey, and the southern portion of New York State; and the KEARNEY ENGINEERING CO., 2402 Market St., Philadelphia, Pa., for southern New Jersey, Wilmington, Del., vicinity, and eastern Pennsylvania areas.

FOX ENGINEERING CO., 1336 Francis St., Jackson, Mich., has been incorporated to succeed the FOX MACHINE CO. The new company has acquired all the patents, patterns, engineering data, and sales records of its predecessor, and is continuing to manufacture the same line of presses and drilling machines.

I. C. MOREAU has been appointed assistant to L. S. Wood, vice-president in charge of engineering of Gar Wood Industries, Inc., Detroit, Mich. Mr. Moreau's duties will be confined to engineering work in the hoist and body division of the company.

ALLEN-BRADLEY CO., Milwaukee, Wis., manufacturer of electric motor controls, has appointed two new representatives for the midwestern states. PAUL BERRY, 3128 N.W. 26th St., Oklahoma City, Okla., will cover the states of Oklahoma and Arkansas. THE MIDWEST EQUIPMENT CO., 1206 Farnam St., Omaha, Neb., will cover Nebraska and western Iowa.

Photo D. D. Spellman

John Sauer, Jr., of the Peninsular Machinery Co., Detroit, Mich., Recently Elected President of the Associated Machine Tool Dealers

New England

JONES & LAMSON MACHINE CO., Springfield, Vt., has just completed an extension to its manufacturing plant. This addition has been found necessary in order to take care of the increased volume of business. The extension covers an area of 24,000 square feet, and accommodates the adminstration, clerical, and engineering offices. The total area covered by the company's plant and offices is now 4 3/4 acres.

BRYANT CHUCKING GRINDER CO., Springfield, Vt., announces that it has just awarded a contract to the Austin Co. for the design and construction of a $40,000 addition to its plant. The addition will provide an increase of 14,000 square feet and will include three 30-foot bays, with provisions for crane operation.

HOLO-KROME SCREW CORPORATION is building an addition of approximately 8500 square feet to its plant in Hartford, Conn. The new building will be of one-story brick construction, so designed as to afford the maximum amount of light. It is stated that the present expansion program is not due to conditions in Europe, but rather to a growing demand for products in the domestic market and to the development of new fields.

New Jersey

KENNETH H. CONDIT, from 1921 to 1938 editor of the *American Machinist*, and more recently executive assistant to the president of the National Industrial Conference Board, has been appointed Dean of the School of Engineering of Princeton University, to succeed Professor ARTHUR M. GREENE, Jr., who will retire next June. Mr. Condit is a graduate in mechanical engineering of Stevens Institute of Technology (1908). In 1913, he received the degree of civil engineering from Princeton University. He has been especially active in the affairs of the American Society of Mechanical Engineers, of which he is now a vice-president.

VASCOLOY-RAMET CORPORATION, North Chicago, Ill., announces that an authorized agency contract for the sale of Vascoloy-Ramet tools, blanks, and wire-drawing dies has been granted to the GENERAL TOOL & DIE CORPORATION, 62 Franklin St., East Orange, N. J. The latter corporation is headed by Leo J. St. Clair, who has been engaged for many years in the engineering and sale of cemented-carbide products.

New York

HENRY D. ROLPH has been made director of export sales of the Yale & Towne Mfg. Co., with headquarters in the Chrysler Bldg., New York City. Mr. Rolph has been connected with the company for over thirty years.

CHARLES E. WILSON, executive vice-president of the General Electric Co., Schenectady, N. Y., was elected president at a recent meeting of the board of directors, succeeding GERARD SWOPE. PHILIP D. REED, assistant to the president, was elected chairman of the board

Philip D. Reed, New Chairman of the Board of Directors, General Electric Co.

Charles E. Wilson, New President of the General Electric Co.

of directors, succeeding OWEN D. YOUNG. Mr. Swope and Mr. Young will continue to serve the company as directors, Mr. Swope becoming honorary president, and Mr. Young honorary chairman of the board.

T. N. ARMSTRONG of the Development and Research Division of the International Nickel Co., Inc., 67 Wall St., New York City, recently addressed the St. Louis chapter of the American Foundrymen's Association on the "Welding and Flame-Hardening of Steel."

The Elmira Chapter of the American Society of Tool Engineers held a meeting at the Hotel Langwell, Elmira, N. Y., on the evening of November 17, when HERMAN GOLDBERG of the R. G. Haskins Co., Chicago, Ill., spoke on "Taps and Tapping," demonstrating his talk by the actual operation of a tapping machine.

GENERAL ELECTRIC CO., Schenectady, N. Y., has recently doubled its facilities for producing arc-welding electrodes through the erection of two new factories, one at Cleveland, Ohio, and the other at Baltimore, Md.

PHILIPPINE COMMERCIAL CO., 347 Fifth Ave., New York City, desires to represent American manufacturers of tools and hardware in the Philippines.

Ohio and Indiana

TOLEDO SCALE CO., Toledo, Ohio, has just started manufacturing in its new factory—the largest plant in the world for making automatic weighing devices. The new factory replaces six old plants scattered throughout Toledo. It covers 250,000 square feet, with a main structure 420 by 440 feet, chiefly one story, and another for administration offices, 240 by 64 feet, two stories high.

WHEELOCK, LOVEJOY & CO., INC., 128 Sidney St., Cambridge, Mass., announces the opening of a new warehouse at 4524 W. Mitchell Ave., Winton Place, Cincinnati, Ohio, where a stock of Hy-Ten steels, as well as S A E alloy steels will be carried.

CHESTER W. RUTH has been appointed director of advertising of the Republic Steel Corporation, Cleveland, Ohio, succeeding STANLEY A. KNISELY, who recently resigned to become executive vice-president of Associated Business Papers, Inc. HAROLD H. OLDHAM becomes assistant director of advertising. Mr. Ruth has been connected with the Republic Steel Corporation since its formation in 1930. He has been manager of the copy and production departments since 1937.

Chester W. Ruth, Director of Advertising of the Republic Steel Corporation

AUBURN AUTOMOBILE CO., Connersville, Ind., announces that since the company ceased to build motor cars in the fall of 1937, it has equipped its plant to stamp, fabricate, and manufacture steel products of all kinds, facilities being available also for the plating, painting, and assembling of products.

Pennsylvania

HYDRO-POWER SYSTEMS, INC., Mount Gilead, Ohio, designers and builders of hydraulic machine drives, have recently established general offices in the Grant Bldg., Pittsburgh, Pa. This move has been made to locate the company's sales and engineering activities centrally, and to facilitate closer working relations with its market, consisting of press builders, machine tool manufacturers, and other machinery builders.

VANADIUM-ALLOYS STEEL CO., Pittsburgh, Pa., announces that the litigation between the company and Philip M. McKenna, involving the McKenna patents on cemented hard carbide compositions, has been settled amicably and the suit terminated. Mr. McKenna has been licensed to continue the manufacture and sale of cemented hard carbide compositions under the name MCKENNA METALS CO., as heretofore.

OHIO GEAR CO., Cleveland, Ohio, has appointed the STANDARD MACHINISTS SUPPLY CO., S. 2nd and McKean Sts., Pittsburgh, Pa., representative for Ohio gears, speed reducers, and power transmission equipment in the Pittsburgh area.

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa., has appointed the J. M. TULL METAL AND SUPPLY CO., INC., 285 Marietta St., N.W., Atlanta, Ga., tool steel representative of the company in the state of Georgia.

KELLY REAMER CO., Cleveland, Ohio, has appointed JAMES S. MURRAY, RD9, South Hills, Pittsburgh, Pa., representative for the exclusive sale of Kelly products in the Pittsburgh district.

FREDERICK J. GRIFFITHS has been appointed executive vice-president in charge of the newly created Alloy Steel Division of the Copperweld Steel Co., Glassport, Pa. Mr. Griffiths is an outstanding pioneer in the development of alloy steels, and has held important positions with a number of concerns in this field. For the last three years he has been president of the Griffiths-Bowman Engineering Co.

Frederick J. Griffiths, Executive Vice-president in Charge of Alloy Steel Division of the Copperweld Steel Co.

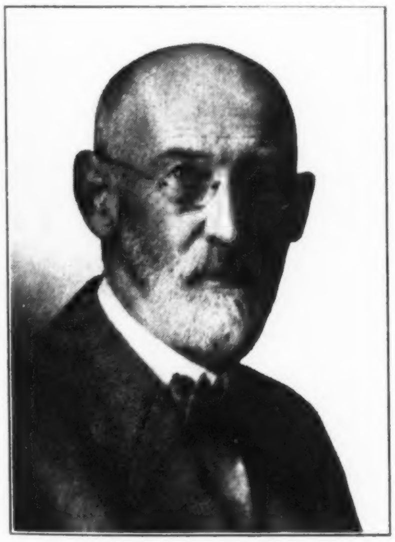
OBITUARIES

William A. Viall

William Angell Viall, vice-president and secretary of the Brown & Sharpe Mfg. Co., Providence, R. I., died on October 24 at his home in Providence, following a heart attack suffered earlier in the week. Two days after his death, he would have been seventy-eight years old.

Mr. Viall was one of the best known men in the entire machine tool industry. He had been connected with the Brown & Sharpe Mfg. Co. for nearly half a century. He was born in Attleboro, Mass., in 1861, being a member of the eighth generation of a family that originally arrived in Massachusetts in 1639. His parents moved to Providence in 1863, where his father, Richmond Viall, entered the employ of the Brown & Sharpe Mfg. Co. as a machinist, later becoming general superintendent of the company.

The young William Viall attended the public schools in Providence and entered Brown University, class of 1884, to take a special laboratory course in chemistry. He left Brown to study in Germany, where he specialized in chemistry, returning to the United States in 1888. He was then connected with Cornell University as an instructor in chemistry for two years.



William A. Viall

Mr. Viall became associated with the Brown & Sharpe Mfg. Co. in 1890. In 1906, he was elected secretary of the company. Several years later he was made vice-president and secretary, and subsequently was elected president of two of the company's subsidiary corporations. He had also many other business interests. He was vice-president and director of the Blackstone Canal National Bank and a director of the Anchor Insurance Co., the Gorham Co. of New York, the Gorham Mfg. Co., the Legal Aid Society of Rhode Island, and the Providence-Washington Insurance Co. He was also president of the Wilcox & Gibbs Sewing Machine Co.

Always interested in the welfare of the machine tool industry as a whole, Mr. Viall took an active part in the affairs of the National Machine Tool Builders' Association, and served as its president for two years. He was at one time president of the New England Foundrymen's Association and the Manufacturers' Research Association of Boston.

His interests were equally broad in civic and charitable organizations. He served on the boards of the Rhode Island Hospital, the Butler Hospital, and the Homoeopathic Hospital. He also served on the boards of the Providence Institution for Savings and the Peoples Savings Bank, and was a former president of the Providence Working Men's Loan Association. At one time he headed the Rhode Island Tuberculosis Association and was a director and vice-president of the Providence Y.M.C.A., not to mention many other civic, charitable, and church organizations with which he was affiliated.

Mr. Viall's wife, Harriet Elizabeth (Warner) Viall, of Medina, Ohio, whom he married in 1891, died in 1934. He leaves a daughter, Mrs. C. Gordon MacLeod, and a son, Richmond, both of Providence, R. I.

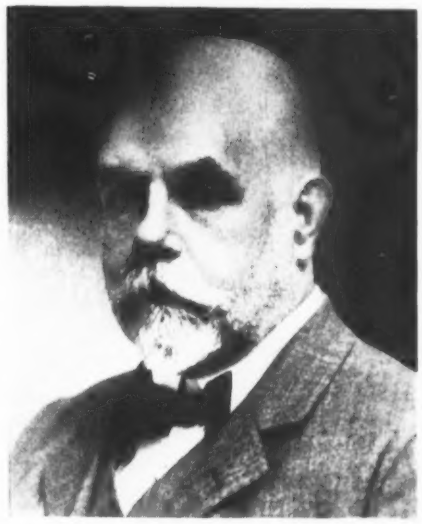
Mr. Viall was one of the most beloved and respected men in the machine tool industry. His advice and judgment on all matters pertaining to the industry was accepted and given careful attention. He will be remembered by all with whom he came in contact for his friendliness, sincerity, and high integrity.

Oscar Harmer

Oscar Harmer, senior director of Alfred Herbert, Ltd., Coventry, England, and one of the best known men in the British machinery industries, died October 11 after a long illness. Although almost ninety years old at the time of his death, he was, up to a few months ago, at his office every day.

Mr. Harmer was born in the United States, and was employed by several leading machine tool builders in this country. He went to England to install and operate the plant of the Capewell Horse Nail Co. at Millwall, where he introduced many ingenious automatic machines. Later he joined the British Babcock-Wilcox Co., reorganizing this company's plant and methods of production. He laid out and equipped the Renfrew Works, and designed many special machines for making parts of the Babcock boiler.

In 1897, Mr. Harmer joined the firm of Alfred Herbert, Ltd., where his ideas on design, manufacturing, and sales policies exerted a great influence on the progress of the firm. He originated the practice of visiting engineering plants, where he studied the work being done, obtained samples, and quoted on machines and tools for their production. He outlined schedules of operations and guaranteed production times, originating the idea of taking orders for machines and tools on the condition that the guarantees would be fulfilled. He always insisted on quality, and the high reputation possessed by Herbert machine tools is, in large measure, due to his insistence on selling on quality rather than on price.



Oscar Harmer

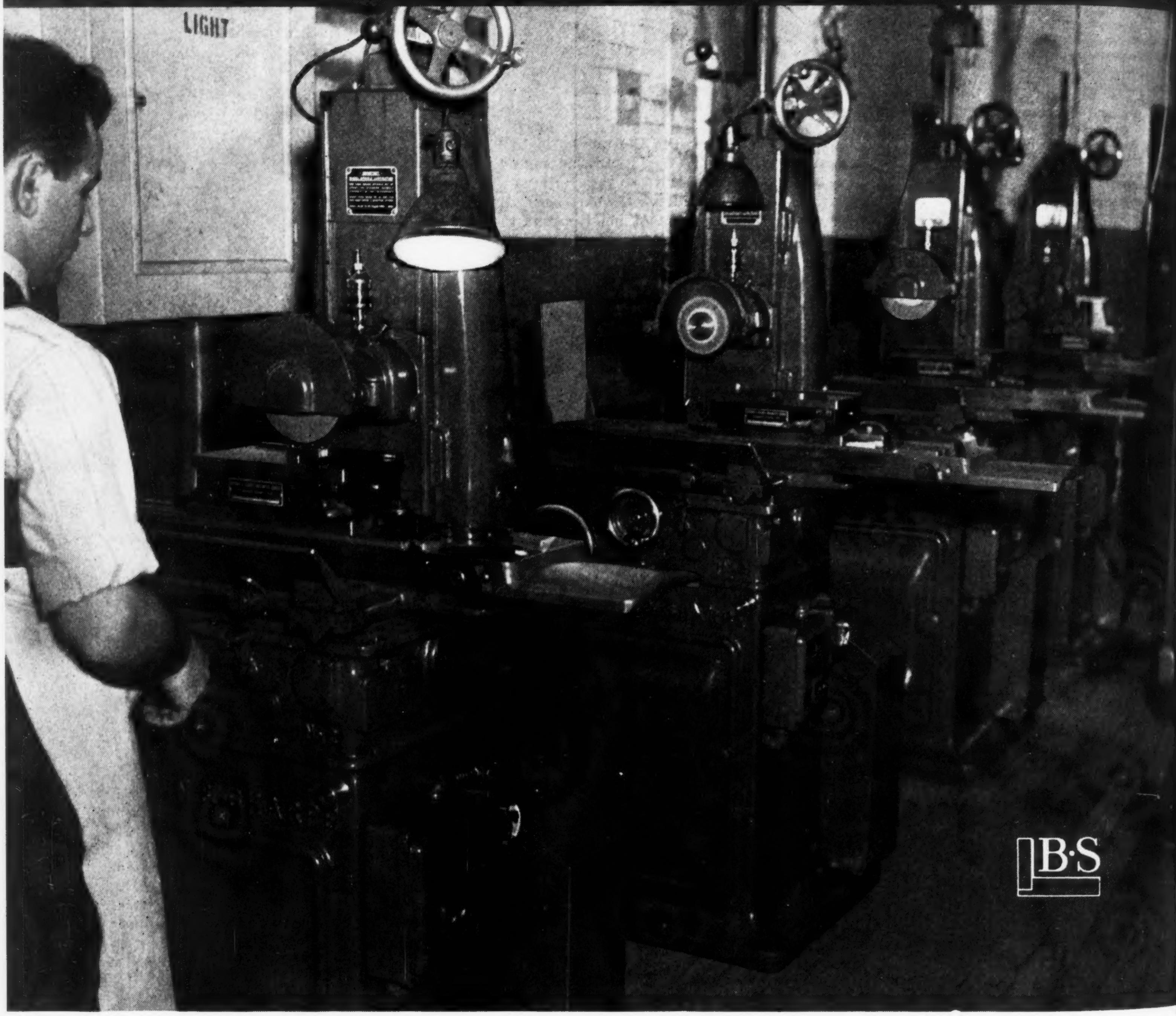
Mr. Harmer was a man of unusual qualities and of boundless energy. He was a born mechanic who appreciated high-class workmanship. The best was barely good enough for him, and he was a merciless critic of everything that fell short of his exacting standards. At the same time, he was intensely practical, and as a salesman he had few equals. He will be missed not only by his associates, but also by a large circle of friends throughout the world.

William J. Hanley, commercial vice-president of the General Electric Co., at Cleveland, Ohio, died in Cleveland on November 9 at the age of seventy-two, after completing fifty-one years of service with the company.

Ralph S. MacPherran, who recently retired as chief chemist of the Allis-Chalmers Mfg. Co., Milwaukee, Wis., after many years of service, died on November 13 at Duluth, Minn. Mr. MacPherran was especially noted as a metallurgist in the field of gray iron.

Joseph Wilhelm, vice-president of the Acme Stamping & Mfg. Co., Pittsburgh, Pa., died on October 23.

ACCURATE-FAST-VERSATILE



Simplicity of design — Quick set-up

Convenience of operation—Minimum maintenance

Long, efficient service

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. . the No. 2 Surface Grinding Machine has won World-Wide Popularity

Supplement the many advantages

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For grinding slots and small surfaces

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The Brown & Sharpe Permanent Magnet Type is particularly handy and economical

4 ¾ Inch Index Centers
For exact spacing of divisions on circumference of work

Adjustable Swivel Vise
Jaws can be tilted to 45° either side of horizontal

The No. 2B Surface Grinding Machine (With Hand Feeds Only) is available where power feeds are not needed.

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NEW BOOKS AND PUBLICATIONS

Modern Plastics Catalogue and Directory. 454 pages, 8 3/4 by 11 3/4 inches. Published by the Breskin Publishing Corporation, 122 E. 42nd St., New York City. Price, $2.

The demand by manufacturers, engineers, and designers for a quick and complete reference to the available data on plastic materials has been fully met by the October issue of the *Modern Plastics Magazine*, separate copies of which are supplied as a complete catalogue and directory covering all synthetic plastics. Each different plastic is described by a specialist in the field, and typical applications are illustrated.

The machinery and equipment section of the catalogue shows all the recent developments in machines and equipment, and the molding and fabricating section is devoted to processes and techniques of handling the various plastic materials. A properties chart, which is stated to be the only one of its kind ever compiled, illustrates the comparative physical characteristics of each material and gives the softening point, molding temperatures, moisture resistance, thermal conductivity, etc. There is a chapter devoted to nomenclature, which lists the various terms used in this industry, and another chapter containing a bibliography of all printed works on this subject.

The directory section gives the names and addresses of those engaged in the industry, including makers of machinery, equipment and supplies, molders, fabricators, and designers, as well as sources of supply of chemicals and raw materials. A complete list of trade names of all plastic materials is included. A distinctive feature of the book is a decorative laminated plastic cover, an unusual application of plastics.

Mechanical Catalog and Directory (1940). 493 pages, 8 1/2 by 11 1/4 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York City. Distributed free to members of the Society. Price to non-members, $3.

This is the twenty-ninth annual mechanical catalogue and directory issued by the Society. The catalogue section contains condensed data on machines, equipment, and materials covering the entire field of mechanical engineering and representing approximately 1500 products. The data is arranged in alphabetical order for convenient reference, and completely indexed.

The directory gives the user a practically complete and authoritative index to all American manufacturers of metals and alloys, power plant equipment, power transmissions, instruments, materials-handling apparatus, aircraft power plants and instruments, foundry and machine shop equipment, heating, ventilating, and air-conditioning machinery, electric motors and controls, equipment for process industries, pumps, fans, compressors, and hundreds of other types of mechanical apparatus. A page reference system in the directory enables one to get a description of the desired machine or equipment from the catalogue section, which contains essential information contributed by cooperating manufacturers.

The book also lists hundreds of trade names of equipment and materials.

MacRae's Blue Book (1939-1940). 3616 pages, 8 1/2 by 11 inches. Published by MacRae's Blue Book Co., 18 E. Huron St., Chicago, Ill. Price, $15.

This is the forty-seventh edition of a comprehensive buyers' guide or directory, covering all of the products manufactured in the United States. The book contains five different sections, as in previous editions. The first section lists the names and addresses of over 45,000 manufacturers and gives the capital ratings, as well as branch plants and offices in many cases. The second section, or finding list, comprises an alphabetical list of products. The classified materials section of the book contains over 2500 pages covering all the manufactured products, arranged alphabetically according to product and giving names and addresses of the manufacturers. The trade facilities section lists all cities having a population of 1000 or more, together with the leading commercial body, bank, and principal warehouses. The last section of the book contains more than 40,000 names of industrial products listed under their trade names. The value of this book to buyers, in locating sources of supply, as well as to sellers, and all others who have to compile mailing lists, is self-evident.

Manual on Cutting of Metals. 319 pages, 5 1/2 by 8 1/2 inches. Published by the American Society of Mechanical Engineers, 29 W. 39th St., New York City. Price, $5.

The material forming the basis of this book has been prepared by the Committee on Metal Cutting Data of the American Society of Mechanical Engineers, in order to correlate the work that has been done by many investigators since Frederick W. Taylor made his renowned address "On the Art of Cutting Metals" before the Society in 1906; to fill in the gaps in their investigations; and to reduce the data to a form that would permit of practical application in the machine shop. This work has been limited to a study of single-point cutting tools as used in turning in the lathe or similar machines. Data have been published in a form that can be used directly by the mechanical engineer, production executive, machine designer, or shop mechanic.

The material is divided into three parts, the first of which discusses factors influencing the cutting of metals. The second contains tabular data on cutting speeds and horsepower for various feeds and depths of cut when cutting steel and cast iron. The third part covers methods of calculating cutting speed, chip pressure, horsepower, and economic tool life.

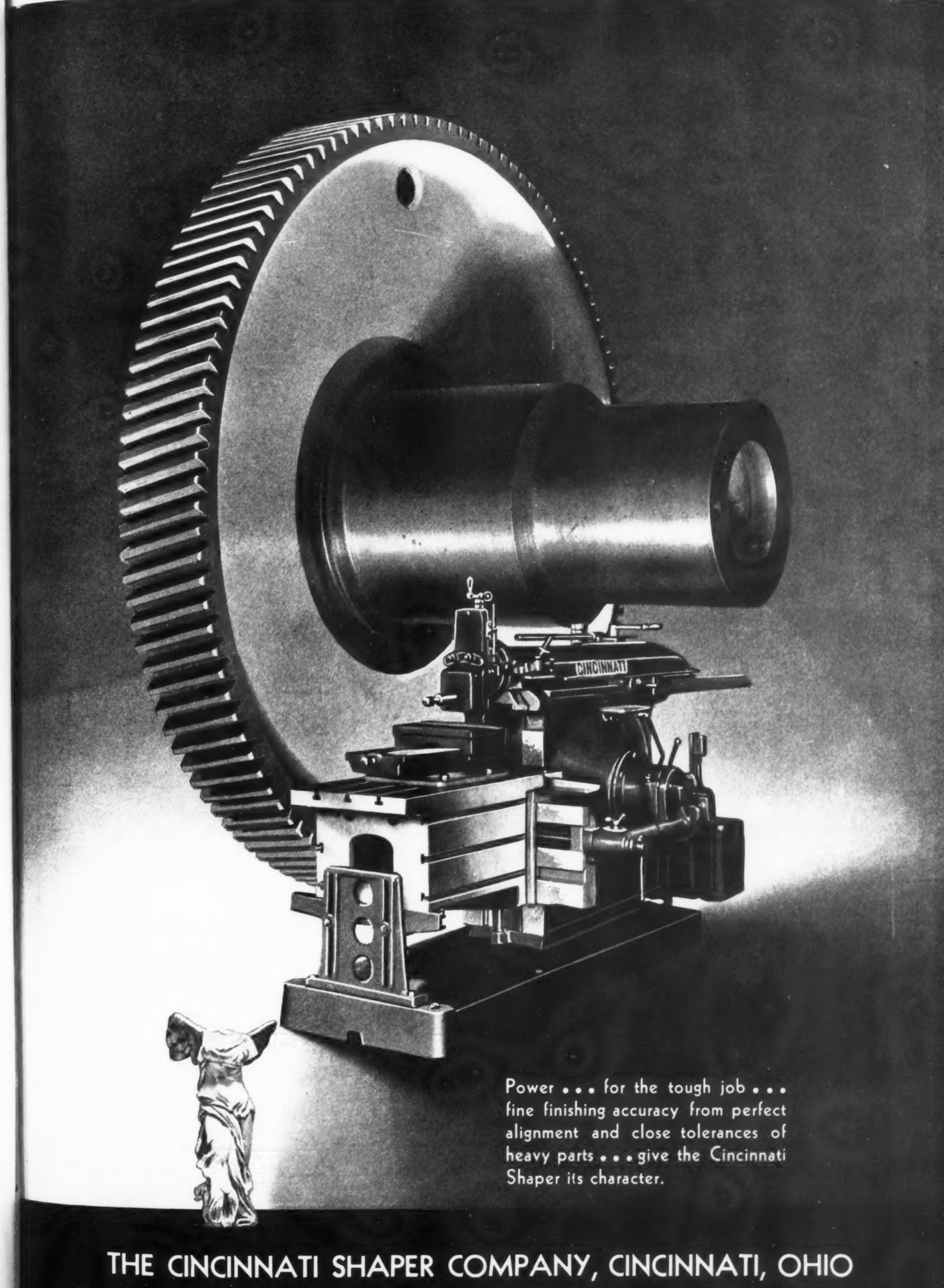
Johnson's Materials of Construction. Rewritten by M. O. Withey and James Aston. 867 pages, 6 by 9 inches. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York City. Price, $6.

This is the eighth edition of a well-known book on materials of construction, which was originally written about forty years ago and has been continually revised and brought up to date. This work is practically a complete handbook on the subject. It contains thirty-two chapters covering all classes of materials used in structural work. In the eighth edition the aim has been to provide the essential information concerning the sources, manufacture, and fabrication of the principal materials; to give carefully selected data covering the more important mechanical and physical properties and the influences of various factors upon these properties; to show the causes of defects and variations and how they may be discovered; to provide an acquaintance with the technique of testing materials; and to present some of the more general uses of different materials. The book is so written that it will serve both as a text and as a reference book.

Graphic Presentation. By Willard C. Brinton. 512 pages, 6 by 9 inches. Published by Brinton Associates, 599 Eleventh Ave., New York City. Price, $5.

This book demonstrates the effectiveness of the graphic method of presenting facts. It contains a description of the use of charts, graphs, and all other methods of graphic presentation for almost every conceivable purpose. The first part of the book describes how to read a chart, and the second part contains suggestions on how to make a chart. The material covers a very wide field. Besides the making of all kinds of charts, the use of color, methods of reproducing and printing, binding, etc., are discussed. The book represents a good example of the use of color in graphic presentation.

The A B C of Aviation. By Lieutenant Colonel Victor W. Pagé, Air Corps Reserve, U. S. Army. 436 pages.


CINCINNATI
Power . . . for the tough job . . . fine finishing accuracy from perfect alignment and close tolerances of heavy parts . . . give the Cincinnati Shaper its character.

5 by 7½ inches; over 200 illustrations. Published by the Norman W. Henley Publishing Co., 2 W. 45th St., New York City. Price, $2.50.

This is an enlarged and revised edition of a text-book or simplified guide for students, mechanics, and non-technical men who wish to obtain a groundwork in the basic principles of aviation. All types of aircrafts are described, and condensed instructions are given on the basic principles of their construction and operation. Information is included on inspection and methods of detecting and remedying trouble. The text also covers control instruments.

COMING EVENTS

DECEMBER 4-8—Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Bellevue-Stratford Hotel, Philadelphia, Pa. C. E. Davies, secretary, 29 W. 39th St., New York City.

DECEMBER 4-9—Seventeenth EXPOSITION OF CHEMICAL INDUSTRIES in the Grand Central Palace, New York City. For further information, apply to Charles F. Roth, president of the International Exposition Co., Grand Central Palace, New York City.

DECEMBER 6-8—Annual convention of the NATIONAL ASSOCIATION OF MANUFACTURERS, and CONGRESS OF AMERICAN INDUSTRY, to be held at the Waldorf-Astoria Hotel, New York City. For further information, address National Association of Manufacturers, 14 W. 49th St., New York City.

DECEMBER 9—EASTERN PHOTOELASTICITY CONFERENCE at Cambridge, Mass., under the auspices of the Massachusetts Institute of Technology. Address inquiries to W. M. Murray, Room 1-321, Massachusetts Institute of Technology, Cambridge, Mass.

JANUARY 15-19, 1940—Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Book-Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary, 29 W. 39th St., New York City.

MARCH 7-9—Annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS in New York City. For further information, communicate with Ford R. Lamb, executive secretary, 2567 W. Grand Blvd., Detroit, Mich.

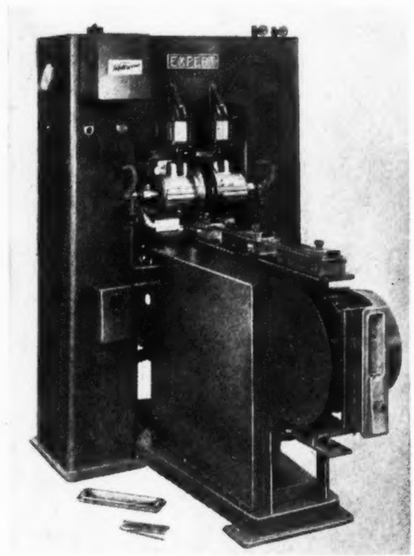
MAY 6-10—Convention and exhibition of the AMERICAN FOUNDRYMEN'S ASSOCIATION to be held in Chicago, Ill., with exhibits at the International Amphitheater, and headquarters of the convention at the Palmer House. American Foundrymen's Association, 222 W. Adams St., Chicago, Ill.

* * *

The American Gear Manufacturers Association, 602 Shields Bldg., Wilkinsburg, Pa., representing the gear industry of the United States, reports that sales of gears for October were over 11 per cent greater than during September, and 95 per cent ahead of October, 1938. For the ten months ending October 31, this year, there was a gain of 32 per cent over the same period last year.

Seam Welder Equipped for Automatic Spot-Welding

The use of a seam welder built recently by the Expert Welding Machine Co., Detroit, Mich., for continuous automatic spot-welding in a large motor plant was made possible by the application of a Model 80 timer built by the Weltronic Corporation, 2832 E. Grand Blvd., Detroit, Mich. The timer accurately controls the length of time the current is on and off, and provides an automatic repeating cycle. The machine is shown in the illustration equipped for spot-welding 19-gage oil baffle plates to 18-gage valve cover plates for both six- and eight-cylinder automobiles.



Seam Welder Equipped with a Weld-timer which Permits Continuous Automatic Spot-welding

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933.

of MACHINERY, published monthly at New York, N. Y., for October 1, 1939.

State of New York }
County of New York } ss.

Before me, a Notary Public, in and for the state and county aforesaid, personally appeared Edgar A. Becker, who having been duly sworn according to law, deposes and says that he is the treasurer of The Industrial Press, Publishers of MACHINERY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, The Industrial Press, 140-148 Lafayette St., New York; Editor, Erik Oberg, 140-148 Lafayette St., New York; Managing Editor, None; Business Managers, Robert B. Luchars, 140-148 Lafayette St., New York; Edgar A. Becker, 140-148 Lafayette St., New York; and Erik Oberg, 140-148 Lafayette St., New York.

2. That the owners of 1 per cent or more of the total amount of stock are: The Industrial Press, 140-148 Lafayette St., New York; Erik Oberg, 140-148 Lafayette St., New York; Robert B. Luchars, 140-148 Lafayette St., New York; Edgar A. Becker, 140-148 Lafayette St., New York; Laura A. Brownell, 140-148 Lafayette St., New York; Franklin D. Jones, 140-148 Lafayette St., New York; First National Bank & Trust Co. of Montclair and Robert B. Luchars, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair and Leigh Roy Urban, Trustees (Beneficiaries unknown), Upper Montclair, N. J.; First National Bank & Trust Co. of Montclair and Kenneth D. Ketchum, Trustees (Beneficiaries unknown), Upper Montclair, N. J.

3. That the known bondholders, mortgagees and other security holders are: Laura A. Brownell, 140-148 Lafayette St., New York; John Connolly, 140-148 Lafayette St., New York; Franklin D. Jones, 140-148 Lafayette St., New York; Robert B. Luchars, 140-148 Lafayette St., New York; Louis Pelletier, 140-148 Lafayette St., New York; Elizabeth Y. Urban, 163 Western Drive, Longmeadow, Mass.; Helen L. Ketchum, King St., Cohasset, Mass.; Wilbert A. Mitchell, 28 Harlow Road, Springfield, Vt., and Henry V. Oberg, 1317 Hill Crest Road, R. D. No. 1, Lancaster, Pa.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company, but also, in cases where the stockholder, or security holder, appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

EDGAR A. BECKER, Treasurer

Sworn to and subscribed before me this 25th day of September, 1939

CHARLES P. ABEL,
Notary Public, Kings County No. 292
(SEAL) Kings Register's No. 1111
New York County No. 217, New York Register's No. 1-A-144
(My commission expires March 30, 1941)